U.S. Department
of Transportation
**Federal Aviation
Administration**

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Standard

PREPARATION OF INTERFACE DOCUMENTATION

FOREWORD

This standard sets forth the requirements for the preparation of three types of interface documentation, the Interface Requirements Document (IRD), the Interface Control Document (ICD), and the Interface Revision (IR).

This standard specifies the minimum content and format for each of the above types of interface documentation, and explains to the preparer of interface documentation how to adequately document a wide variety of interfaces.

This standard is intended for use by the Federal Aviation Administration (FAA), and by contractors to the FAA involved in the production of interface documentation.

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1. SCOPE

1.1 Scope. This standard establishes the format and minimum content of a Interface Requirements Document (IRDs), Interface Control Document (ICDs), and Interface Revision (IRs) used by the Federal Aviation Administration (FAA).

1.2 Purpose. The purpose of this standard is to provide a set of instructions for the preparation of IRDs, ICDs, and IRs.

2. APPLICABLE DOCUMENTS

The following documents form a part of this standard to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this standard, the contents of this standard shall be considered the superseding requirement. The following references are the documents used, by date, in this standard. IRDs should reflect the latest version of the documents, or the date of the documents that are under contract by a project.

2.1 Government documents.

STANDARDS:

FAA

FAA-STD-002c	Facilities Engineering Drawing Preparation, October 1987
FAA-STD-005d	Preparation of Specification Documents, February 1980
FAA-STD-021a	Configuration Management, August 1987
FAA-STD-023	Microfilming of Engineering and Electrical Drawings, September 1985
FAA-STD-029a	Selection Of Telecommunications Standards, December 1990
FAA-STD-032	Design Standards for National Airspace System Physical facilities, April 1986
FAA-STD-039	National Airspace System (NAS) Open Systems Architecture and Protocols, October 1991
FAA-STD-043	National Airspace System (NAS) Open Systems Interconnection (OSI) Priority, October 1991
FAA-G-2100e SCN-1, SCN-2	Electronic Equipment, General Requirements, March 1987, June 1987, August 1990

Military

MIL-STD-100	Engineering Drawing Practices, September 1991

FAA Orders

FAA Order 7350.5V	FAA Location Identifiers, February 1989

Other Publications

Related IRDs

Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the contracting officer.

2.2 Non-government documents.

STANDARDS:

International Organization for Standardization (ISO)

ISO 8648:1988 E	Information Processing Systems - Open Systems Interconnection - Internal Organization of the Network Layer, February 1988

Institute of Electrical and Electronic Engineers (IEEE)

IEEE 315-1975	Graphic Symbols for Electric and Electronics Diagrams (including reference class designation letters) (with ANSI Y32.2), 1975
IEEE 315A-1986	Graphic Symbols for Electric and Electronics Diagrams (supplement to IEEE std 315-1975), 1986

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.

2.3 Document Sources.

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and users in Federal agencies.

2.3.1 Source of FAA Documents. Copies of FAA specifications, standards, and publications may be obtained from the Contracting Officer, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D. C., 20591. Requests should clearly identify the desired material by number and date, and state the intended use of the material.

2.3.2 Military and Federal Documents. Single copies of unclassified military and federal specifications, standards, and publications may be obtained by writing the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA, 19120; or by calling (215) 697-321 Monday through Friday, 8:00 a.m. to :30 p.m. E.S.T.

2.3.3 ANSI and ISO Documents. Copies of ANSI and ISO standards may be obtained from the American National Standards Institute, 1430 Broadway, New York, NY, 10018.

2.3.4 EIA Documents. Copies of EIA standards may be obtained from, the Electrical Industries Association, 2001 Eye Street, N.W., Washington, D. C., 20006.

2.3.5 NEC-NFPA Documents. Copies of NEC-NFPA standards may be obtained from the NEC-NFPA, Batterymarch Park, Quincy, MA, 02269.

2.3.6 FCC Documents. Copies of FCC codes may be obtained from the U. S. Government Printing Office, Washington, D. C., 20402.

3. REQUIREMENTS

3.1 Interface requirements document preparation. Subsystem/subsystem IRDs shall be prepared in accordance with Appendix I and Appendix VI. Facility-type IRDs shall be prepared in accordance with Appendix II.

3.2 Interface control document preparation. Subsystem/subsystem ICDs shall be prepared in accordance with Appendix III. For facility to subsystem interfaces the requirements of Appendix II will be verified by Project Implementation Plans and Site Specific Drawings.

3.3 Interface revision preparation. IRs shall be prepared in accordance with Appendix IV.

3.4 Development Guide. Appendix VI is an introduction to the interface management process and a guide for developing Interface Requirements Documents (IRDs) and Interface Revisions (IRs). It is intended for new authors as well as those who have previously developed IRDs and IRs.

4. QUALITY ASSURANCE PROVISIONS

This section is not applicable to this standard.

5. PREPARATION FOR DELIVERY

This section is not applicable to this standard.

6. NOTES

6.1 Definitions. The following definitions apply to the use of these terms in the Appendicies to this standard. Where these terms are used in interface documentation, these definitions shall apply.

6.1.1 Application Entity. Application Entity (AE) is that process in the application layer which provides information transfer and other Open Systems Interconnection (OSI) services to an application process.

6.1.2 Application Process. An Application Process (AP) is the functionality within a system that processes the information required for a particular application. An AP is a logical representation of related subprocesses implemented on a system to perform a specific application. Examples of some APs that might be found in the National Airspace System (NAS) are Flight Plan Processing, Hazardous Weather Processing, Wind Shear Alert Processing, Aircraft Surveillance Processing, Runway Visual Range Processing, Notices to Airmen (NOTAM) Message Processing, Weather Product Processing, Remote Monitoring Subsystem (RMS) Message Processing, Radio Control Equipment (RCE) Configuration and Status Information Processing, and Network Management Processing.

6.1.3 Drawing. Figures, block diagrams, schematics, wiring diagrams, or any other form of government or industry accepted graphic representation approved by the FAA for use in interface documentation.

6.1.4 Equipment item. An identifiable piece of hardware and/or software that can be bounded with a specification and interface definitions.

6.1.5 End system. An end system contains the application processes that are the ultimate sources and destinations of user-oriented message flows. The functions of an end system can be distributed among more than one processor/computer.

6.1.6 Facility. The total plant (e.g. building, structure, enclosure, assembly, Open-Air Plan "site") required for a subsystem/equipment item to function. The facility will (at a particular geographic location) house, support, and protect the subsystem/equipment item. Facility characteristics will be determined by the total complement of dependent subsystems/equipment items.

6.1.7 Fixed format messages. Messages specified for use in the NAS environment which have an invariant structure.

6.1.8 Functional interfaces. Interfaces that interact across non-material boundaries. Functional interfaces are described in terms of information transfer.

6.1.9 Interface. A common functional and/or physical boundary where hardware/software interact.

6.1.10 Interface control document. A formal agreement prepared by the contractor(s) which documents how the interface requirements between two subsystems are implemented; the as-built configuration. The ICD identifies, quantifies, and controls the design characteristics of the interface. The ICD ensures interface compatibility by documenting form, fit, and function.

6.1.11 Interface requirements document. A document written by the FAA (or by contractors under contract to the FAA for the production of specification documentation) to specify the interface requirements between two subsystems or between a facility and a subsystem. An IRD is also used to ensure that the interface requirements between an existing subsystem/facility and a new subsystem/facility are agreed to by all affected FAA project offices.

6.1.12 Interface revision. A document used to revise an IRD or ICD and to ensure that proper incorporation of revisions takes place. The IR is designed to work within established FAA Configuration management procedures.

6.1.13 Intermediate system. An intermediate system interconnects two or more subnetworks. For example, it might connect a local area network with a wide area network. It performs routing and relaying of traffic. A processor can implement the functions of both an end system and an intermediate system.

A system implementing all seven layers of the OSI model may provide services directly to users (acting as an end system), and it may connect subnetworks (acting as an intermediate system). When it performs the functions of an intermediate system, only the lower three layers of the OSI model are invoked.

6.1.14 Open systems. An open system is a system capable of communicating with other open systems by virtue of implementing OSI protocols and services. End systems and intermediate systems are open systems. However, an open system may not be accessable by all other open systems. This isolation may be provided by physical separation or by technical capabilities based upon computer and communications security.

6.1.15 Physical interfaces. Interfaces associated with material contact. Physical interfaces are described in terms of the mechanical, electrical, and environmental characteristics.

6.1.16 Point of demarcation. The demarcation point represents the line of division of contractual responsibility between interfacing equipment vendors.

6.1.17 Scheduled messages. Messages that are sent at specified times (e.g. aviation weather reports, forecasts, etc.).

6.1.18 System. A system is simple a group of subsystems.

6.1.19 Subsystem. A grouping of one or more equipment items that are relatively independent identifiable entities.

6.1.20 Telecommunications equipment. The telecommunications equipment will provide for the distribution of voice and data between FAA facilities and FAA facilities and non-FAA facilities (e.g., military towers to ACF).

6.1.21 Unscheduled messages. Messages that are sent on an as needed basis (e.g. severe weather warnings).

6.1.22 User system. See end system.

6.1.23 Variable length messages. Messages specified for use in the NAS environment with a variable structure for fields (e.g. allowing "n" copies of field "m" to transmit parameters for up to "n" locations) or free form text.

6.2 Abbreviations and acronyms. The following abbreviations and acronyms are used in this standard. Where these terms are used in interface documentation, these definitions shall apply.

AAS	Advanced Automation System
ACCC	Area Control Computer Complex
ACF	Area Control Facility
AE	Application Entity
ANSI	American National Standards Institute
AP	Application Process
ASCII	American Standard Code for Information Interchange
ATCT	Air Traffic Control Tower
CCB	Change Control Board
CCD	Change Control Decision
CCITT	International Telegraph and Telephone Consultative Committee
CDR	Critical Design Review
CI	Configuration Item
CIP	Capital Investment Plan
CM	Configuration Management
CSCI	Computer Software Configuration Item
DCE	Data Circuit-Terminating Equipment
DOCCON	Document Control
DTE	Data Terminal Equipment
EIA	Electronic Industries Association
EDB	Engineering Database
FAA	Federal Aviation Administration
HDLC	High Level Data Link Control
HWCI	Hardware Configuration Item
ICD	Interface Control Document
ICWG	Interface Control Working Group
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IFM	Interface Management
IR	Interface Revision
IRD	Interface Requirements Document
ISO	International Organization for Standardization
ISSS	Initial Sector Suite System
kVA	Kilovoltampere
LAPB	Link Access Procedure Balanced
LCN	Local Communications Network
LDRCL	Low-density RCL
LLC	Logical Link Control
MIL	Military
NADIN	National Airspace Data Interchange Network
NAS	National Airspace System
NCP	NAS Change Proposal
NEXRAD	Next-generation Weather Radar
NIU	Network Interface Unit

NIST	National Institute of Standards and Technology
NOTAM	Notice to Airmen
ORD	Operational Readiness Date
OSI	Open Systems Interconnection
PARB	Program Assessment Review Board
PDR	Preliminary Design Review
PM	Project Management
PRB	Pre-review Board
PSN	Packet-switched Network
RCE	Radio Control Equipment
RCL	Radio Communications Link
RCR	Routing and Circuit Restoral
RFP	Request for Proposal
RMM	Remote Maintenance Monitoring
RMS	Remote Monitoring Subsystem
RWP	Real-time Weather Processor
SE	System Engineering
SEI	System Engineering and Integration
SOW	Statement of Work
STD	Standard
TBS	To Be Supplied
TCCC	Tower Control Computer Complex
TDWR	Terminal Doppler Weather Radar
TIM	Technical Interchange Meeting
VRTM	Verification Requirements Traceability Matrix

6.3 Key word index. A list of words and phrases that when cataloged will lead researchers to this document for additional information because of its subject and content. Examples of terms are: interface documentation, interface control, interface requirements, and VRTM.

APPENDIX I

10. SUBSYSTEM/SUBSYSTEM INTERFACE REQUIREMENTS DOCUMENT PREPARATION

10.1 General preparation requirements for IRDs. The following general preparation requirements shall apply to all subsystem/subsystem IRDs.

10.1.1 IRD Format. Each IRD shall conform, at a minimum, to the generic format presented in Figure 10-1 of this standard. Appendices may be used to specify requirements or to provide information in an IRD when the material is lengthy or otherwise does not fit the Figure 10-1 format. When appendices are used to impose requirements, the appendices shall be referenced in a manner that specifies that they are requirements. If an item required by the Figure 10-1 format is not required to properly specify interface requirements in a particular IRD, the words "This IRD imposes no explicit [title of subsection or paragraph] requirements" shall be used. This does not preclude the incorporation of such items in the subsequent ICD, if appropriate to satisfy implicit requirements, such as those derived from implementation considerations. If an item required by the Figure 10-1 format is not yet sufficiently defined to permit the specification of requirements, it shall be identified by use of the term/acronym "To Be Supplied" (TBS). If TBS is used, the TBS shall be defined prior to the baseline of the IRD. If an item required by the Figure 10-1 format is definitely not applicable to the interface being specified, it shall be identified by use of the term "Not Applicable." In instances where the requirements imposed by an entire subsection are imposed by reference to another IRD, it shall be necessary to list only the number and title of the subsection, followed by the reference to the appropriate IRD. Where this is done, it shall not be necessary to list each paragraph of the subsection as required by the Figure 10-1 format. Figures shall be numbered using arabic numerals for the second digit (ie. 3-1, 3-2) and tables shall be numbered using capital Roman numerals for the second digit (ie, 3-I, 4-I).

10.1.2 IRD standards. IRDs shall be prepared in accordance with this appendix and FAA-STD-005. Drawings used to impose requirements shall comply with FAA-STD-002 and MIL-STD-100, as applicable. Clarity and legibility shall meet the reproducibility requirements of FAA-STD-023.

10.1.3 Basic approach. Government or industry standards and specifications; or documents that act in the capacity of defacto standards or specifications shall be used to specify interface requirements whenever possible. Drawings, figures, tables, and written text shall be used to supplement requirements contained in a standard or specification, or in the absence of an applicable standard or specification. Standards or specifications may also be used in an IRD to provide information or clarification without imposing requirements.

10.1.4 Headers. Each page of an IRD, including the front cover, shall contain a header in the upper right hand corner of that page. Each header shall contain the IRD number and the date of the IRD. If the IRD is a draft document, the word "DRAFT" shall follow the date and be represented in capital letters. IRD numbers shall be obtained from the FAA. If the IRD is a revision to a baselined IRD, the revision letter shall be included immediately under the IRD number by use of the word "REVISION" in capital letters, followed by the revision letter of the IRD.

10.1.5 Page numbers. The cover of the IRD shall be considered to be the first page, although no page number shall appear on the cover. Page numbering shall begin on the Approval Signature Page. The Approval Signature, Revision Record, Effectivity, and Table of Contents pages shall be numbered using lower case Roman numerals. The Approval Signature page shall be numbered "ii," with the pages through the Table of Contents numbered sequentially. The page beginning with Section 1, SCOPE, shall be numbered as page "1" using Arabic numerals. The subsequent pages of the IRD, including appendices, shall also be numbered sequentially using Arabic numerals.

10.1.6 Paragraphing. This appendix uses the terms section, subsection, and paragraph in discussing the structural requirements for an IRD. The terms section and subsection are used in the conventional sense. The use of the term paragraph is far more liberal, and can mean a single paragraph or multiple paragraphs that are subparagraphs of a main paragraph. The author of an IRD shall subparagraph as necessary to present interface requirements in a logical, concise, and understandable manner. Each subparagraph shall be numbered. All requirements are to be structured such that only one "shall" appears in a uniquely identifiable text entity. They must be stated in Section 3, Interface Requirements, and appear in a one-to-one correspondence relationship in the Verification Requirements Traceability Matrix (VRTM) in Section 4.

10.1.6.1 Reference publications. IRDs should reflect the latest version of the documents, or the date of the documents that are under contract. When requirements are contained in reference documents the author will have to specify the extent (tailoring) of the requirements and additionally specify the verification methods for these requirements. Assure that when lower level documents are cited that the choices and options are clearly indicated.

10.2 IRD publication requirements. The following publication requirements shall apply to all subsystem/subsystem IRDs.

10.2.1 Covers. Covers for IRDs shall be in accordance with the format presented in Figure 10-2. IRD covers shall be produced using FAA WA Form 4510-1. The IRD title shall identify the interfacing subsystems. In the case where the number of interfacing subsystems precludes listing each in the title, a generic title may be used.

10.2.2 Approval Signature Page. The Approval Signature page shall be the first interior page of an IRD, and be in accordance with the format presented in Figure 10-3.

10.2.3 Revision record. The Revision Record page shall be in accordance with the format presented in Figure 10-4. The "REVISION LETTER" column shall show the revision letter assigned at the time of each incorporation. The "DESCRIPTION" column shall briefly describe the change that was incorporated. In the "DATE" and "ENTERED BY" columns, approval signatures shall be affixed and dated for each revision letter entry.

10.2.4 Effectivity. Effectivity pages shall not be included in IRDs. The location of equipment will be specified in NAS System Specification (NAS-SS-1000), Volume 1 Appendix II.

10.2.5 Table of Contents. The Table of Contents shall outline the contents of the document by sections and paragraphs. Their respective title and page number shall be listed in parallel columns in the order in which they appear in the document. The Table of Contents shall be in accordance with the format presented in Figure 10-6.

10.3 Section 1, SCOPE. The contents of this section shall be as defined in the following paragraphs.

10.3.1 Subsection 1.1, Scope. The scope shall consist of a brief summary of the contents of the IRD and its intended purpose. At a minimum, the scope shall contain the following sentence: "This IRD provides the requirements for an interface between the [subsystem] and the [subsystem]".

10.3.2 Subsection 1.2, Subsystem responsibility list. The subsystem responsibility list shall appear immediately after the scope. The list shall consist of the interfacing subsystems with the respective common name and the responsible FAA program office.

10.4 Section 2, APPLICABLE DOCUMENTS. Applicable documents shall be listed in accordance with FAA-STD-005. The contents of this section shall be as defined in the following paragraphs. All documentation citations shall contain the identification of the specific issue of the cited document.

10.4.1 Subsection 2.1, Government documents. Government source documents (standards, specifications, publications, etc.) referenced in the IRD shall be listed. Other IRDs referenced by this IRD shall be listed in this subsection under the category "OTHER PUBLICATIONS."

10.4.2 Subsection 2.2, Non-government documents. Non-government source documents referenced in the IRD shall be listed.

10.4.3 Subsection 2.3, Document Sources. A list of names and addresses of orgnaizations and the types of documents they have available.

10.5 Section 3, INTERFACE REQUIREMENTS. This section of the IRD shall specify the general, functional, and physical interface requirements between end systems, intermediate systems, user systems, and subsystems. Included shall be performance requirements allocated by higher level specifications and any man-machine interface (MMI) peculiar requirements. Requirements shall be specified only to the extent necessary to ensure adequate interface design.

10.5.1 Subsection 3.1, General requirements. This subsection shall distinctly identify the interfacing subsystems, the point of interface, and functions/services provided by the interface.

10.5.1.1 Subsection 3.1.1, Man-machine interface requirements. Describes any man-machine interface (MMI) and computer-human interface (CHI) requirements not specified elsewhere in the IRD.

10.5.2 Subsection 3.2, Functional requirements. This subsection of the IRD shall specify the functional requirements for the interface as described in the following paragraphs. Functional requirements can for example be identified in three categories of interfaces: OSI-type data; Analog-type (Voice); and Discrete-type (Radio). There can be other categories. Performance and tolerance requirements shall be specified to the extent that they are appropriate to the functional requirement being specified. This subsection, Functional requirements, is required in each IRD written to this standard, and the contents will vary based on the purpose that the interface is intended to fulfill. The functional interface connection between subsystems, shall be specified as illustrated in Figure 10-8. The NAS Subsystem Connectivity Diagram will be in Figure 10-5. This figure illustrates a) DTE to DTE connection or b) DTE to DCE Connection.

10.5.2.1 Subsection 3.2.1, How to specify requirements for interfaces involving user applications processes. Interfaces involving computer processing of user application information shall specify the applciation Process(es) (AP) that will be present in the interface (reference Section 6.2, Definitions, for the definition of "Application Process"). The following types of requirements shall be specified for Application Processes to the degree that they are to be present.

10.5.2.1.1 Subsection 3.2.1.1, Identification of each Application Process. Identify and describe each Application Process present in the interface. A descriptive name may be provided.

10.5.2.1.2 Subsection 3.2.1.2, Types of service required by the Application Process. Describe the kind of service(s) required by the AP (e.g. message transfer, file transfer, data base inquiry, weather graphics, surveillance, sensor, etc.). Specify the National Airspace System (NAS) category of service; critical, essential, or routine.

10.5.2.1.3 Subsection 3.2.1.3, Information units. Identify the units of information that may be transferred across the interface (e.g. messages, requests, acknowledgements, files, sensor and surveillance data messages, error messages, control messages, reports, etc.). If message type numbers have been associated with the information units, they should be listed to provide traceability. Specific information unit types (e.g. specific message types) should be identified. Specify the following requirements for each information unit.

a. Information code/structure - Identify the representation and structure of the information exchanged between the APs (e.g. ASCII, binary, graphic, etc.) Include the format for each information unit specifying the fields and field lengths. This may be indicated in an appendix.

b. Information unit segmentation - Specify any segmentation required of the AP for each information unit. Include the maximum and minimum information unit sizes.

c. Information flow - Indicate the direction of flow of each informat on unit (e.g. indicate initiator/responder of the information unit. Describe the procedures for initiating and responding to each information unit.

d. Frequency of transmission - Indicate scheduled and unscheduled information unit transfer (include the times for the scheduled transfers and the average number of transfers per unit of time for the unscheduled transfers). Include maximum requirements that can occur (e.g., peak transmission frequency).

e. Responses - Indicate if responses (including acknowledgements) are required for specific information unit transfers. Specify the response (e.g. te specific information unit type) and the response timer values. Indicate the maximum time allowed for receipt of an expected response.

10.5.2.1.4 Subsection 3.2.1.4, Quality of Service (QOS) The quality of service (QOS) parameters required by the AP shall be documented and may include:

a. Priority - "Indicate the relative importance of each information unit type in relation to other unit types processed by communicating NAS APs. NAS applications shall use the AP priority indicators specified in FAA-STD-043 in this section when exercising the priority option specified in application layer protocol standards used by the NAS.". The information priority

capabilities of the lower OSI layers have nothing to do with AP information priority.

b. Security - Indicate any security requirements such as protection from unauthorized access to specific information.

c. Residual Error Rate - The ratio of total incorrect, lost and duplicate data units to the total data units transferred across the network service boundry during a measured period.

d. Transfer time constraints - Specify any performance requirements for the Application Process(es). Include any maximum transfer times for each information unit.

e. Throughput - The number of data units transferred divided by the time between first and last.

10.5.2.1.5 Subsection 3.2.1.5, AP Error handling. Error handling procedures of the AP should be specified as required. Clarify what constitutes an error condition. The error handling capabilities of the lower OSI layers are unrelated to the AP error handling process.

10.5.2.1.6 Subsection 3.2.1.6, Interface Summary table - An interface summary table (reference Figure 10-7) shall be used to establish links between the messages that flow across the interface and the functions (Application Processes) by each of the interfacing systems. The interface sumary table shall consist of three columns. The left column shall list the Source. Application Process, and the subprocesses. The middle column shall contain the names of the messages connected to a subprocess and the reference praragraph. The right hand column shall list the Sink, the Application Process and the subprocess.

For the interfacing subsystems listed in the left and right columns list as follows.

a. For each software source and sink function, the interface summary table shall designate an application Process by name and a matching Application Process for the interfacing subsystems.

b. For each Application Process, the interface summary table shall designate a set of one or more subprocess(es) corresponding to subfunctions that originate or terminate specific data communications. For convenience, the subprocess(es) should be sequentially numbered as a subset within the Application Process numbering.

c. For each pair of subprocesses, one or more specific message shall be listed. Each message shall represent a functional link between a pair of subprocesses listed as the logical interface for the two subsystems.

d. For any Application Process, subprocess, or message that cannot be identified, entries in the table shall be marked "TBS".

10.5.2.2 Subsection 3.2.2, OSI-type data interface. Functional requirements shall be specified for an OSI-type interface, where applicable, for each layer of the International Organization on for Standardization (ISO)/OSI model specified. FAA-STD-039 provides a data communications architecture and defines the protocol standards for open systems communications within the NAS. The architecture defined in FAA-STD-039 is based on the seven layers. The contents of this subsection, shall address each of the following seven OSI layers where applicable.

3.2.1	Application Layer
3.2.2	Presentation Layer
3.2.3	Session Layer
3.2.4	Transport Layer
3.2.5	Network Layer
3.2.6	Data Link Layer
3.2.7	Physical Layer
3.2.7.1	DTE to DCE Interconnection
3.2.7.2	DTE to DCE Interconnection with Intermediate Equipment
3.2.7.2.1	DTE Intermediate Equipment
3.2.7.2.2	DCE Intermediate Equipment
3.2.7.2.3	DTE to DTE

10.5.2.3 Subsection 3.2.3, Analog-type interface (Voice). The functional requirements for an analog-type interface in accordance with FAA-STD-029 shall specify the number of analog signal paths required in each direction; the nature of the signals (e.g. voice band audio); the requirements for switching, control, and supervisory signaling; and the common electronic characteristics of the analog signals to be accommodated by the communications link or network that serves the interface (e.g. frequency bandwidth, impedance, signal level, noise and distortion limits, etc.). Any other requirements (for signal processing, signaling, call set-up, etc.) that pertain to the analog portion of the interface shall also be specified.

10.5.2.4 Subsection 3.2.4, Discrete-type interface (Radio). The functional requirements for a discrete-type interface in accordance with FAA-STD-029 shall specify the number of control signal paths to be used in each direction; functional requirements for switching, signaling, etc.; functions controlled on each signal path (e.g. "receiver mute" or "automatic gain control"); the common electrical characteristics (e.g. voltage, polarity, rise time,

frequency, pulse rate, etc.) to be accommodated by the communications link or network which serves the interface; and any other requirements that pertain to the discrete control signal portion of the interface.

10.5.2.5 Subsection 3.2.5, Interface requirements table. In addition to specifying the functional requirements of the interface in the textual format required by the previous paragraphs, interface functional requirements shall also be summarized in an interface requirements table or matrix. The interface requirements table will serve as a "quick-look" reference. Included shall be message identification (e.g. number, name, etc.); format type; message sizes (whether fixed or variable lengths); frequency/rate of transmission. The reference source for messages mandated by international treaties, agreements with government agencies, etc. shall also be included. An example of this interface requirements table is illustrated in Figure 10-9.

10.5.3 Subsection 3.3, Physical requirements. In certain cases where one or more of the subsystems supplies electrical/mechanical/environmental support to another subsystem, the physical requirements must be documented in an IRD as described in the following paragraphs. Performance and tolerance requirements shall be specified to the extent that they are appropriate to the functional requirement being specified.

10.5.3.1 Paragraph 3.3.1, Electrical power/electronic requirements. This paragraph of the IRD shall specify the electrical power/electronic requirements associated with the interface. The electrical power requirements are those which relate to the transfer of primary-type power between subsystems. Electronic requirements are those which relate to the process of signaling or controlling. The specific electrical power/electronic factors to be considered in specifying the power transfer requirements are:

a. Voltage
b. Frequency
c. Current
d. Transients (voltage and current)
e. Maximum ripple
f. Wave form and distortion
g. Polarity (±), number of phases, and phase rotation
h. Protection (voltage and current)
i. Power and kilovoltamperes (kVA) and power factor (displacement and distortion)
j. Maximum noise level

This paragraph is required only when one subsystem will provide power to the interfacing subsystem.

10.5.3.1.1 Subparagraph 3.3.1.1, Connectors. This paragraph of the IRD shall specify the requirements for electrical power/electronic connectors. When it is necessary to specify requirements for connectors, such requirements may include the mechanical and electrical characteristics of size, shape, type, design, materials, finishes, number of pins, gender, polarity, fastening requirements, and voltage or current limitations.

10.5.3.1.2 Subparagraph 3.3.1.2 Wire/Cable. This paragraph is required only when there are specific limitations to cable lengths. When paragraph is used reference FAA-STD-019 and FAA-STD-020.

10.5.3.1.3 Subparagraph 3.3.1.3, Electrical power/electronic referencing (grounding). This paragraph of the IRD shall specify how each circuit is connected to the common electrical reference(s) for power and signals. This paragraph is required only if the subject material is not specified in section 3.2.7, Physical Layer.

10.5.3.1.4 Subparagraph 3.3.1.4, Fasteners. This paragraph of the IRD shall specify the fasteners to be used to assemble interfacing components. Mechanical jackscrews (size #4-40 or larger) shall be provided to maintain secure electrical connections between mating parts in accordance with FAA-G-2100. These fasteners shall be equipped with retainers to prevent their loss when connectors are unmated. This is intended for DB/25 and DB/9 connectors.

10.5.3.1.5 Subparagraph 3.3.1.5, Electromagnetic compatability. This paragraph is required only when one subsystem imposes specific limits on the electromagnetic compatability requirements to the interfacing subsystem. Such requirements include signal transmission characteristics, radar interface and communications interface.

10.6 Section 4, QUALITY ASSURANCE PROVISIONS. This section of the IRD shall specify the process of verification for interface requirements presented in Section 3 of the IRD. For requirements specified in an external reference, refer to Section 10.1.6.1 for verification methodology.

10.6.1 Subsection 4.1, General. This subsection shall contain the following statement: "Verification shall be in accordance with Table [4-x], Verification Requirements Traceability Matrix (VRTM)." Verification levels and methods implemented in the VRTM are defined in the following paragraphs.

10.6.2 Subsection 4.2, Responsibility for verification. This subsection shall contain a statement to the effect that the government has responsibility for developing and implementing the verification of requirements for each project. The government may delegate verification activities to other organizations, independent contractors, and/or the major prime contractor.

10.6.3 Subsection 4.3, Special verification requirements. This subsection of the IRD shall list and describe any special verification requirements necessary to verify the technical requirements imposed by Section 3, Interface Requirements, of the IRD. These special verification requirements shall include, but not be limited to those defined in the following paragraphs.

10.6.3.1 Subsection 4.3.1, ISO Conformance. The system under test (SUT) shall consist of all ISO/GOSIP protocols specified in this document, along with that part of the physical device required to support these protocols. Proof of ISO/GOSIP conformance shall be provided by the contractor, and shall consist of an SUT's entry in the GOSIP register, indicating that the product has been certified as ISO/GOSIP conformant by a NIST accredited testing agency. Any ISO protocol specified in this document, and not tested in the test suite used by the testing agency, must be demonstrated to be conformant, by the contractor, using some other test method, subject to FAA approval.

10.6.3.2 Subsection 4.3.2, ISO Interoperability. Prior to the start of integration level verification, interoperability of ISO protocols shall be demonstrated by testing the SUT against an approved test reference system, using test suites which are GOSIP registered. This testing shall be conducted by a NIST approved interoperability testing agency. FAA procurement agents are responsible for obtaining the results of interoperability testing from the contracor.

10.6.3.3 Subsection 4.3.3, Non-ISO Interoperability. Prior to the start of integration level verification, functional interoperability not related to ISO/GOSIP protocols shall be demonstrated at the FAATC System Support Computer Complex (SSCC).

10.6.4 Table [4-x], Verification Requirements Traceability Matrix. Each IRD shall contain a VRTM that conforms to the format specified by Figure 10-10 and with contents that provide verification of each technical requirement contained in Section 3 of the IRD. If Section 3 of the IRD references an appendix of the IRD for requirements, each requirement contained in the appendix of the IRD shall also be listed in the VRTM with the appropriate verification. Only those verification methods used in the VRTM shall be identified at the top of the VRTM and defined in the following paragraphs.

10.6.5 Subsection 4.4, Verification levels and methods. The levels and methods of verification appropriate for use in the VRTM, presented in Section 4 of the IRD, are defined in the following paragraphs.

10.6.5.1 Paragraph 4.4.1, Verification levels. The three levels of verification are: Subsystem, Integration, and Site. All requirements imposed by Section 3 of the IRD shall be verified at one or more of these three levels.

a. Subsystem-level. This level of verification is usually accomplished at the contractor's facility and culminates in the formal acceptance of a contractual end-item.

b. Integration-level. This level of verification is conducted at the FAA Technical Center, or at a key site. The verification conducted will determine if the hardware, software, or subsystem to be deployed for site installation will perform in a NAS environment and in accordance with NAS system-level operational and functional requirements.

c. Site-level. This level of verification is usually performed at the designated site. The verification portion of the subsystem installation and checkout will emphasize demonstration of the overall system performance requirements. It includes the demonstration of an end-item, subsystem and/or system, the final acceptance demonstrations, and commissioning activities.

10.6.5.2 Paragraph 4.4.2, Verification methods. The four verification methods that can be used at any of the three verification levels are as follows.

a. Inspection. Inspection is a method of verification to determine compliance without the use of special laboratory equipment, procedures, or services, and consists of a non-destructive static-state examination of the hardware, software, and/or the technical data and documentation.

b. Test. Test is a method of verification wherein performance is measured during or after the controlled application of functional and/or environmental stimuli. Quantitative measurements are analyzed to determine the degree of compliance. The process uses standardized laboratory equipment, procedures, and/or services.

c. Demonstration. Demonstration is a method of verification where qualitative determination of properties is made for a configuration item, including software and/or the use of technical data and documentation. The items being verified are observed, but not quantitatively measured, in a dynamic state.

d. Analysis. Analysis is a method of verification where hardware or software designs are compared with known scientific and technical principles, procedures, and practices to estimate the capability of the proposed design to meet the mission and system requirements.

10.7 Section 5, PREPARATION FOR DELIVERY. This section of the IRD shall specify any "interface peculiar" preparation for delivery requirements.

10.8 Section 6, NOTES. This section of the IRD shall contain information of a general or explanatory nature. No requirements shall appear in Section 6. It shall contain information designed to assist in determining the applicability of the IRD.

10.8.1 Subsection 6.1, Operational concept. This subsection shall contain information relative to the use of the configuration item covered by the IRD. A brief summary of the functions of the subsystem relative to the interfacing subsystem should be included.

10.8.2 Subsection 6.2, Definitions. This subsection shall define all non-standard terms used in the IRD. Terms that are defined in FAA-STD-025, section 6.1, shall have the same definition in the IRD.

10.8.3 Subsection 6.3, Abbreviations and acronyms. This subsection shall define all abbreviations and acronyms used in the IRD. Entries that are defined in FAA-STD-025, section 6.2, shall have the same definition in the IRD.

10.8.4 Subsection 6.4, Key word index. This subsection shall list any key words or phrases used in the IRD for reference to the interfacing subsystems.

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Figure 10-1. IRD Format Outline (continued)

[IRD Number]
[Rev Letter]
[Date]

U.S. Department of Transportation
Federal Aviation Administration
Interface Requirements Document

[Interfacing Subsystem/Subsystem]

Figure 10-2. IRD Cover page (FAA WA Form 4510-1)

[IRD Number]
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INTERFACE REQUIREMENTS DOCUMENT

APPROVAL SIGNATURE PAGE

[Interfacing Subsystem/Subsystem]

APPROVAL SIGNATURES		
PARTICIPANT	NAME	DATE
[PROJECT A]		
[PROJECT B]		
[NAS SYSTEM ENGINEERING]		

Figure 10-3. IRD Approval Signature Page

			[IRD Number] [Rev Letter] [Date]
REVISION RECORD			
REVISION LETTER	DESCRIPTION	DATE	ENTERED BY

Figure 10-4. IRD Revision Record

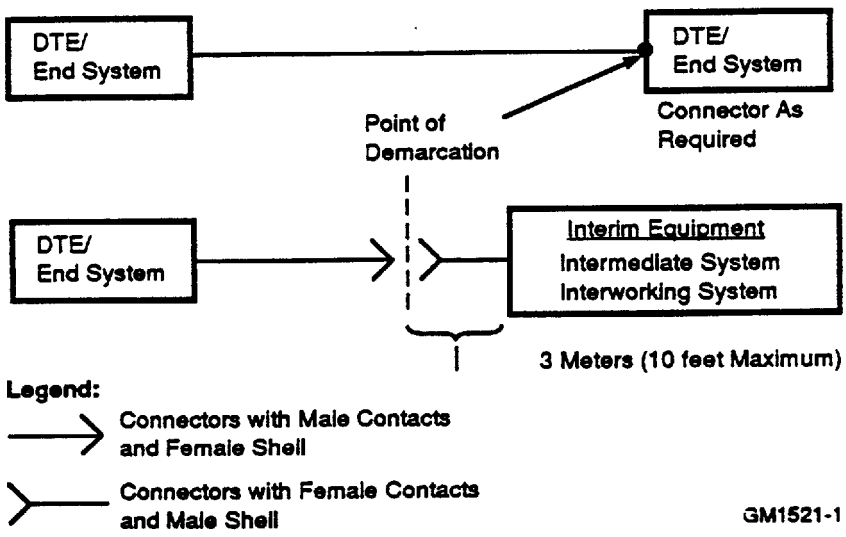

Figure 10-5. NAS Subsystem Connectivity

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Figure 10-6. IRD Table of Contents

Source	Message	Ref Para	Sink
End System			End System
Application Process			Application Process
Subprocess			Subprocess
Subprocess			Subprocess

GM1521A-1

Figure 10-7. Example Interface Summary Table

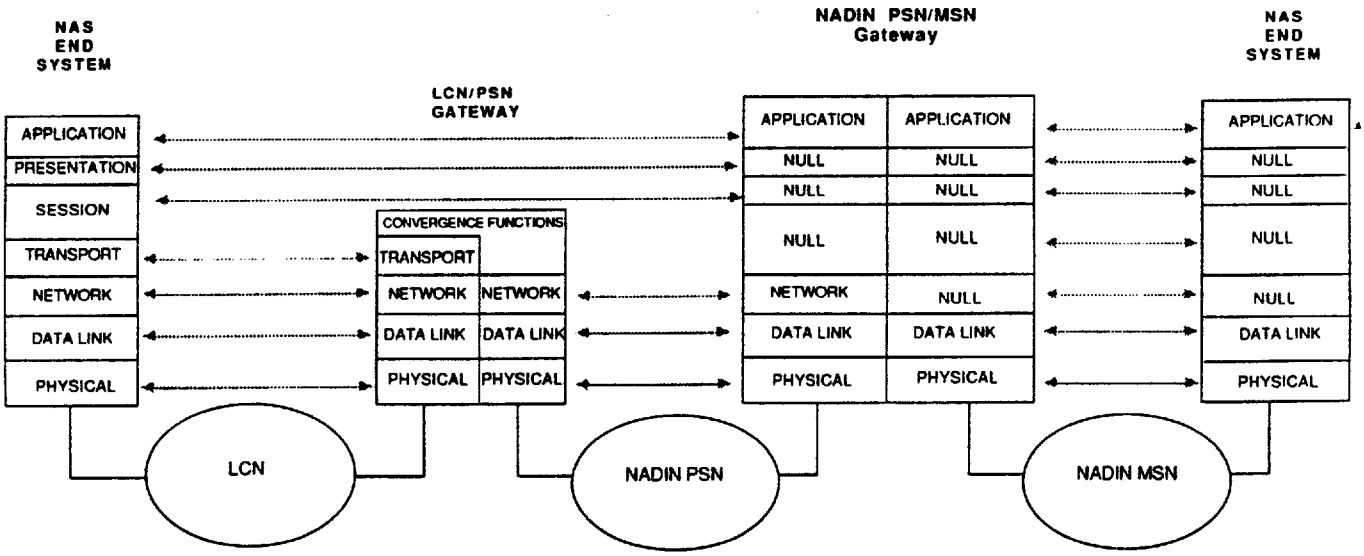

FIGURE 1 - NAS Internetworking

Figure 10-8. Typical Functional Interface Diagram

Application Process Name	Message Name	Message Function Code (Hex Code)	Message Flow ACCC ◄► MPS	Estimated Message Frequency	Message Size (Bytes)	Maximum Transfer Time Constraints (seconds)
Maintenance Status Data Processing	Alarm	41	→	101/yr	Variable; 2048 max	1.5
	Alert	61	→	62b/yr	Variable; 2048 max	1.5
	State Change	43	→	10.0/day	Variable; 2048 max	1.5
	Return to Normal	42	→	as necessary	Variable; 2048 max	1.5
	NAS Subsystem Status Request	4C	→	128/day	Fixed; 4 max	1.5
	NAS Subsystem Status Data	4D	←	.128/day	Fixed; 19 max	1.5
	Subsystem Status Command	4A	←	128/day	Fixed; 4 max	1.5
	Subsystem Status Data	48	→	128/day	Variable; 778 max	1.5
Error Data Processing	Invalid Request/ Command	45	◄►	as necessary	Variable; 2,048 max	1.5

Figure 10-9. Example Interface Requirements Table

Table [4-x] Verification Requirements Traceability Matrix

A = Analysis D = Demonstration I = Inspection T = Test X = Not Applicable

SECTION 3 REQUIREMENTS PARAGRAPH REFERENCE	VERIFICATION LEVEL AND METHOD			
	SUBSYSTEM LEVEL	SYSTEM LEVEL	SITE LEVEL	REMARKS

Figure 10-10. VRTM Format

APPENDIX II

20. FACILITY-TYPE INTERFACE REQUIREMENTS DOCUMENT PREPARATION

20.1 General preparation requirements for IRDs. The following general preparation requirements shall apply to all facility-type IRDs.

20.1.1 IRD Format. Each IRD shall conform, at a minimum, to the generic format presented in Figure 20-1 of this standard. If an item required by the Figure 20-1 format is not yet sufficiently defined to permit the specification of requirements, it shall be identified by use of the term/acronym "To Be Supplied" (TBS). If "TBS" is used, the TBS shall be defined prior to the baselining of the IRD. If an item required by the Figure 20-1 format is definitely not applicable to the interface being specified, it shall be identified by use of the term "Not Applicable." Figures shall be numbered using arabic numerals for the second digit (ie. 3-1, 3-2) and tables shall be numbered using capital Roman numerals for the second digit (ie, 3-I, 4-I).

20.1.2 IRD standards. IRDs shall be prepared in accordance with this appendix and FAA-STD-005. Drawings prepared for use in imposing requirements shall comply with FAA-STD-002 and MIL-STD-100, as applicable. Clarity and legibility shall meet the reproducibility requirements of FAA-STD-023.

20.1.3 Basic approach. Government or industry standards and specifications; or documents that act in the capacity of de-facto standards or specifications shall be used to specify interface requirements whenever possible. Drawings, figures, tables, and written text shall be used to supplement requirements contained in a standard or specification, or in the absence of an applicable standard or specification. Standards or specifications may also be used in an IRD to provide information or clarification without imposing requirements.

20.1.4 Headers. Each page of an IRD, including the front cover, shall contain a header in the upper right hand corner of that page. Each header shall contain the IRD number and the date of the IRD. If the IRD is a draft document, the word "DRAFT" shall follow the date and be represented in capital letters. IRD numbers shall be obtained from the FAA. If the IRD is a revision to a baselined IRD, the revision letter shall be included immediately under the IRD number by use of the word "REVISION" in capital letters, followed by the revision letter of the IRD.

20.1.5 Page numbers. The cover of the IRD shall be considered to be the first page, although no page number shall appear on the cover. Page numbering shall begin on the Approval Signature page. The Approval Signature, Revision Record, Effectivity, and Table of Contents pages shall be numbered using lower case Roman numerals. The Approval Signature page shall be numbered "ii," with the pages through the Table of Contents numbered sequentially. The page beginning with Section 1, SCOPE, shall be numbered as page "1" using Arabic

numerals. The subsequent pages of the IRD, including appendices, shall also be numbered sequentially using Arabic numerals.

20.1.6 Paragraphing. This appendix uses the terms section, subsection, and paragraph in discussing the structural requirements for an IRD. The terms section and subsection are used in the conventional sense. The use of the term paragraph is far more liberal, and can mean a single paragraph or multiple paragraphs that are subparagraphs of a main paragraph. The author of an IRD shall subparagraph as necessary to present interface requirements in a logical, concise, and understandable manner. Each subparagraph shall be numbered. All requirements are to be structured such that only one "shall" appears in an uniquely identifiable text entity.

20.1.6.1 Reference publications. IRDs should reflect the lattest version of the documents, or the date of the documents that are under contract. When requirements are contained in reference documents the author will have to specify the extent (tailoring) of the requirements and additionally specify the verification methods for these requirements. Assure that when lower level documents are cited that the choices and options are clearly indicated.

20.2 IRD publication requirements. The following publication requirements shall apply to all facility-type IRDs.

20.2.1 Covers. Covers for IRDs shall be in accordance with the format presented in Figure 20-2. IRD covers shall be produced using FAA WA Form 4510-1. The IRD title shall identify the interfacing facility/subsystem.

20.2.2 Approval Signature Page. The Approval Signature page shall be the first interior page of an IRD, and be in accordance with the format presented in Figure 20-3.

20.2.3 Revision record. The Revision Record page shall be in accordance with the format presented in Figure 20-4. The "REVISION LETTER" column shall show the revision letter assigned at the time of each incorporation. The "DESCRIPTION" column shall briefly describe the change that was incorporated. In the "DATE" and "ENTERED BY" columns, approval signatures shall be affixed and dated for each revision letter entry.

20.2.4 Effectivity. Effectivity pages shall not be included in IRDs. The location of equipment will be specified in NAS System Specification (NAS-SS-1000), Volume 1 Appendix II.

20.2.5 Table of Contents. The Table of Contents shall outline the contents of the document by sections and paragraphs. Their respective title and page number shall be listed in parallel columns in the order in which they appear in the document. The Table of Contents shall be in accordance with the format presented in Figure 20-6.

20.3 Section 1, SCOPE. The contents of this section shall be as defined in the following paragraphs.

20.3.1 Subsection 1.1, Scope. The scope shall consist of a brief summary of the contents of the IRD and its intended purpose. At a minimum, the scope shall contain the following sentence: "This IRD provides the requirements for an interface between the [facility] and the [subsystem]."

20.3.2 Subsection 1.2, Facility/Subsystem responsibility list. The facility/subsystem responsibility list shall appear immediately after the scope. It shall consist of a list of the interfacing facility/subsystems with their respective common names and the responsible FAA project offices.

20.4 Section 2, APPLICABLE DOCUMENTS. Applicable documents shall be listed in accordance with FAA-STD-005. The contents of this section shall be as defined in the following paragraphs. All document citations shall contain the identification of the specific issue of the cited document.

20.4.1 Subsection 2.1, Government documents. Government source documents (standards, specifications, publications, etc.) referenced in the IRD shall be listed. Other IRDs referenced by this IRD shall be listed in this subsection under the category "OTHER PUBLICATIONS."

20.4.2 Subsection 2.2, Non-government documents. Non-government source documents referenced in the IRD shall be listed.

20.5 Section 3, INTERFACE REQUIREMENTS. This section of the IRD shall specify the general, physical, and project unique interface requirements between a facility and a subsystem. Requirements shall be specified only to the extent necessary to ensure adequate interface design.

20.5.1 Subsection 3.1, General requirements. This subsection shall contain the following statements: "The [subsystem] equipment shall be installed in the [facility] and will require space, heating, ventilation, and air-conditioning (HVAC). Safety, security, and environmental requirements are specified in FAA-STD-032."

20.5.2 Subsection 3.2, Physical requirements. This subsection shall specify the physical requirements of the interface in terms of envelope (space), electrical (power), and environmental (HVAC) requirements. These physical requirements shall be represented in a respective data table as illustrated in Figures 20-7a, 20-7b, and 20-7c. In some instances it may be advantageous to use text, as identified in the following paragraphs, to specify requirements in addition to the data tables. Project unique requirements necessary to ensure proper operation of the physical aspects of the interface shall also be specified. Performance and tolerance requirements shall be specified to the extent that they are appropriate to the functional requirement being specified.

20.5.2.1 Paragraph 3.2.1, Envelope. This paragraph shall specify the envelope, footprint, location and orientation requirements necessitated by the interface. Minimum and maximum space requirements of subsystem/equipment items shall be specified to ensure compatibility with associated facilities and to mitigate possible detrimental interaction. The impact of accessibility, environmental, and envelope factors on the interface shall be taken into account when specifying interface location and orientation. Adequate space to allow for maintenance access shall also be specified. Figure 20-8 illustrates an example of the location, space, and orientation information. Unless the exact quantities, sizes, and locations of equipment can be specified to exact and relative scale, equipment layouts should not be included in this figure. In the absence of a detailed scaled equipment layout the figure should specify the boundary of the allocated space with square footage, and columns indicated (when applicable).

20.5.2.2 Paragraph 3.2.2, Electrical. This paragraph shall specify the electrical requirements/characteristics necessary to ensure both the compatibility and the capacity of the electrical power supplied by a facility to a subsystem. The following electrical factors shall be considered in specifying the electrical power requirements.

a. Voltage
b. Frequency (all power frequencies are 60 hz +/- 2%)
c. Current
d. Transients (voltage, current, inrush current, and harmonic distortion)
e. Polarity (+/- for DC only), number of phases, and phase rotation.
f. Power, kilovoltamperes (kVA), and power factor (lagging or leading)

Tolerances/ranges shall be included when specifying quantitative values. The range(s) of electrical power loading that will be placed on the facility by all potential modes of subsystem operation must be considered. Figure 20-9 illustrates an example of a power connection interface diagram.

20.5.2.3 Paragraph 3.2.3, Environmental. This paragraph shall specify the environmental requirements/characteristics necessary for the facility to support subsystem operations. The following environmental factors shall be considered in specifying the environmental requirements.

a. ambient temperature of operations
b. relative humidity
c. cooling load subsystem loads to be imposed on the facility
d. heating load subsystem loads to be imposed on the facility

20.5.3 Subsection 3.3, Project unique. This subsection shall specify unique subsystem requirements that 1) the facility must provide to the subsystem in order for the subsystem to operate as designed and 2) is a service/requriement not typically provided by a facility. Included among the project unique requriements would be specialized structural supports; special grounding, bonding, or shielding requirements; power conditioning requriements; special lighting; raised flooring; noise abatement; specialized subsystem water or forced air cooling; and security/accessibility requirements.

For example, "The ASDE-3 antenna subsystem, consisting of a radiating assembly, radome/rotodome, pedestal, rotating joint and other components mounted on top of the ATCT tower cab shall not impart a dead load greater than 3300 pounds to the structure."

20.6 Section 4, QUALITY ASSURANCE PROVISIONS. This section of the IRD shall specify the process of verification for interface requirements presented in Section 3 of the IRD. For requirements specified in an external reference, refer to Section 10.1.6.1 for verification methodology.

20.6.1 Subsection 4.1, General. This subsection shall contain the following statement: "Verification shall be in accordance with Table [4-x], Verification Requirements Traceability Matrix (VRTM)." Verification levels and methods implemented in the VRTM are defined in the following paragraphs.

20.6.2 Subsection 4.2, Responsibility for verification. This subsection shall contain a statement to the effect that the government has responsibility for developing and implementing the verification of requirements for each project. The government may delegate verification activities to other organizations, independent contractors, and/or the major prime contractor.

20.6.3 Subsection 4.3, Special verification requirements. This subsection of the IRD shall list and describe any special verification requirements necessary to verify the technical requirements imposed by Section 3, Interface Requirements, of the IRD.

20.6.4 Table [4-x], Verification Requirements Traceability Matrix. Each IRD shall contain a VRTM that conforms to the format specified by Figure 20-5 and with contents that provide verification of each technical requirement contained in Section 3 of the IRD. If Section 3 of the IRD references an appendix of the IRD for requirements, each requirement contained in the appendix of the IRD shall also be listed in the VRTM with the appropriate verification. Only those verification methods used in the VRTM shall be identified at the top of the VRTM and defined in the following paragraphs.

20.6.5 Subsection 4.4, Verification levels and methods. The levels and methods of verification appropriate for use in the VRTM, presented in Section 4 of the IRD, are defined in the following paragraphs.

20.6.5.1 Paragraph 4.4.1, Verification levels. The three levels of verification are: Subsystem, Integration, and Site. All requirements imposed by Section 3 of the IRD shall be verified at one or more of these three levels.

a. Subsystem-level. This level of verification is usually accomplished at the contractor's facility and culminates in the formal acceptance of a contractual end-item.

b. Integration-level. This level of verification is conducted at the FAA Technical Center, or at a key site. The verification conducted will determine if the hardware, software, or subsystem to be deployed for site installation will perform in a NAS environment and in accordance with NAS system-level operational and functional requirements.

c. Site-level. This level of verification is usually performed at the designated site. The verification portion of the subsystem installation and checkout will emphasize demonstration of the overall system performance requirements. It includes the demonstration of an end-item, subsystem and/or system, the final acceptance demonstrations, and commissioning activities.

20.6.5.2 Paragraph 4.4.2, Verification methods. The four verification methods that can be used at any of the three verification levels are as follows.

a. Inspection. Inspection is a method of verification to determine compliance without the use of special laboratory equipment, procedures, or services, and consists of a non-destructive static-state examination of the hardware, software, and/or the technical data and documentation.

b. Test. Test is a method of verification wherein performance is measured during or after the controlled application of functional and/or environmental stimuli. Quantitative measurements are analyzed to determine the degree of compliance. The process uses standardized laboratory equipment, procedures, and/or services.

c. Demonstration. Demonstration is a method of verification where qualitative determination of properties is made for a configuration item, including software and/or the use of technical data and documentation. The items being verified are observed, but not quantitatively measured, in a dynamic state.

d. Analysis. Analysis is a method of verification where hardware or software designs are compared with known scientific and technical principles, procedures, and practices to estimate the capability of the proposed design to meet the mission and system requirements.

20.7 Section 5, PREPARATION FOR DELIVERY. This section is not applicable to facility type IRDs.

20.8 Section 6, NOTES. This section of the IRD shall contain information of a general or explanatory nature. No requirements shall appear in Section 6. It shall contain information designed to assist in determining the applicability of the IRD.

20.8.1 Subsection 6.1, Operational concept. This subsection shall contain information relative to the use of the configuration item covered by the IRD. A brief summary of the functions of the subsystem relative to the interfacing subsystem should be included.

20.8.2 Subsection 6.2, Definitions. This subsection shall define all non-standard terms used in the IRD. Terms that are defined in FAA-STD-025, section 6.1, shall have the same definition in the IRD.

20.8.3 Subsection 6.3, Abbreviations and acronyms. This subsection shall define all abbreviations and acronyms used in the IRD. Entries that are defined in FAA-STD-025, section 6.2, shall have the same definitions in the IRD.

20.8.4 Subsection 6.4, Key word index. This subsection shall list any key words or phrases used in the IRD for reference to the interfacing facility/subsystem.

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Figure 20-1. IRD Format Outline

[IRD Number]
[Rev Letter]
[Date]

U.S. Department of Transportation
Federal Aviation Administration
Interface Requirements Document

[Interfacing Facility/Subsystem]

Figure 20-2. IRD Cover page (FAA WA Form 4510-1)

[IRD Number]
[Rev Letter]
[Date]

INTERFACE REQUIREMENTS DOCUMENT

APPROVAL SIGNATURE PAGE

[Interfacing Facility/Subsystem]

APPROVAL SIGNATURES		
PARTICIPANT	NAME	DATE
[PROJECT A]		
[FACILITY SYSTEM ENGINEERING SERVICE]		
[NAS TRANSITION AND IMPLEMENTATION]		

Figure 20-3. IRD Approval Signature Page

[IRD Number]
[Rev Letter]
[Date]

REVISION RECORD

REVISION LETTER	DESCRIPTION	DATE	ENTERED BY

Figure 20-4. IRD Revision Record

Table [4-x] Verification Requirements Traceability Matrix

A = Analysis D = Demonstration I = Inspection T = Test X = Not Applicable

SECTION 3 REQUIREMENTS PARAGRAPH REFERENCE	VERIFICATION LEVEL AND METHOD			
	SUBSYSTEM LEVEL	SYSTEM LEVEL	SITE LEVEL	REMARKS

Figure 20-5. VRTM Format

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Figure 20-6. IRD Table of Contents

[Subsystem] ENVELOPE REQUIREMENTS

COMPONENT NAME	QTY	WIDTH (IN)	DEPTH (IN)	HEIGHT (IN)	FRONT CLEAR (IN)	REAR CLEAR (IN)	UNIT SPACE (SF)	TOTAL SPACE (SF)	UNIT WEIGHT (LBS)	TOTAL WEIGHT (LBS)
CAB:										
TEST CONTROL PANEL P							0.00	0.00		0.00
								0.00		0.00
								0.00		0.00
								0.00		0.00
							SUBTOTAL	0.00		0.00
EQUIPMENT ROOM:										
EQUIPMENT RACK G								0.00		0.00
								0.00		0.00
								0.00		0.00
								0.00		0.00
							SUBTOTAL	0.00		0.00
								0.00		0.00
								0.00		0.00
								0.00		0.00
								0.00		0.00
							SUBTOTAL	0.00		0.00
							SUBSYSTEM TOTAL	0.00		0.00

P = PANEL-MOUNTED (WIDTH X HEIGHT)
G = PROVIDED BY ATCT IF AVAILABLE;
OR BY THE [Subsystem] INSTALLER IN ORDER TO
ASSURE THAT RACK-MOUNTED COMPONENTS
OF [Subsystem] WILL BE INSTALLED IN THE SAME RACK.
SF = SQUARE FEET

Figure 20-7a. Envelope Requirements Data Table (Sample)

[Subsystem] ELECTRICAL REQUIREMENTS

COMPONENT NAME	QTY	CRITICAL POWER VOLTS V	PHS	UNIT KVA	TOTAL KVA	UNIT KW	TOTAL KW	ESSENTIAL POWER VOLTS V	PHS	UNIT KVA	TOTAL KVA	UNIT KW	TOTAL KW
CAB:					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
				SUBTOTAL	0.00		0.00			SUBTOTAL	0.00		0.00
EQUIPMENT ROOM:													
EQUIPMENT RACK					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
				SUBTOTAL	0.00		0.00			SUBTOTAL	0.00		0.00
					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
					0.00		0.00				0.00		0.00
				SUBTOTAL	0.00		0.00			SUBTOTAL	0.00		0.00
				Total Crit KVA/KW	0.00		0.00			Total Ess KVA/KW	0.00		0.00

SERVICE	QTY	COMMERCIAL/BUILDING SERVICES POWER VOLTS V	PHS	UNIT KVA	TOTAL KVA	UNIT KW	TOTAL KW
LIGHTING					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
				SUBTOTAL	0.00		0.00
ENVIRONMENTAL SUPPORT EQUIPMENT					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
				SUBTOTAL	0.00		0.00
GENERAL							
TOOLS					0.00		0.00
COMPUTERS					0.00		0.00
					0.00		0.00
					0.00		0.00
				SUBTOTAL	0.00		0.00
				Total Commercial KVA/KW	0.00		0.00

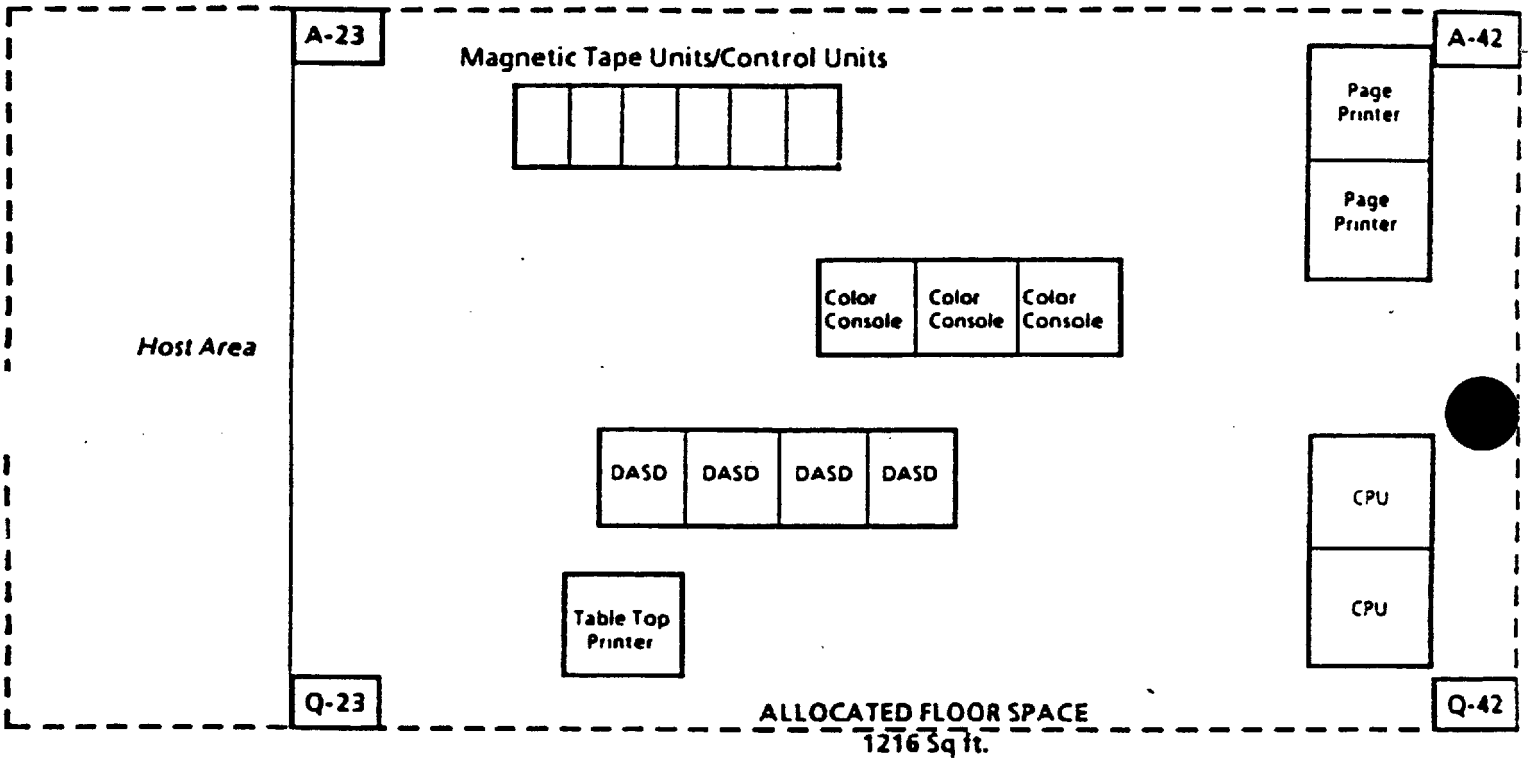
Frequency is 60 Hz + or - 2 % unless otherwise specified.

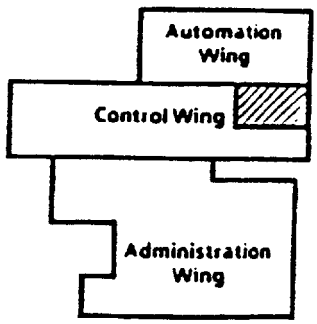
Figure 20-7b. Electrical Requirements Data Table (Sample)

(Subsystem) ENVIRONMENTAL REQUIREMENTS

COMPONENT NAME	QTY	UNIT HEAT GEN (BTU/H)	TOTAL HEAT GEN (BTU/H)	AMBIENT CONDITIONS							
				ROOM TEMP		HUMID %		UNDERFLOOR TEMP		HUMID %	
				DEG F(L)	DEG F(H)	RH (L)	RH (H)	DEG F(L)	DEG F(H)	RH (L)	RH (H)
CAB:			0.00								
			0.00								
			0.00								
			0.00								
	SUBTOTAL		0.00								
EQUIPMENT ROOM:											
EQUIPMENT RACK			0.00								
			0.00								
			0.00								
			0.00								
	SUBTOTAL		0.00								
			0.00								
			0.00								
			0.00								
			0.00								
	SUBTOTAL		0.00								
TOTAL SUBSYSTEM BTU/H			0.00								

Figure 20-7c. Environmental Requirements Data Table (Sample)





Standard ARTCC
Key Plan

Note:

a. Location, space, and orientation may vary based on ACF effectivity
b Dotted corner alphanumerics are wing floor location coordinates

Figure 20-8. Location and Orientation Diagram (Sample)

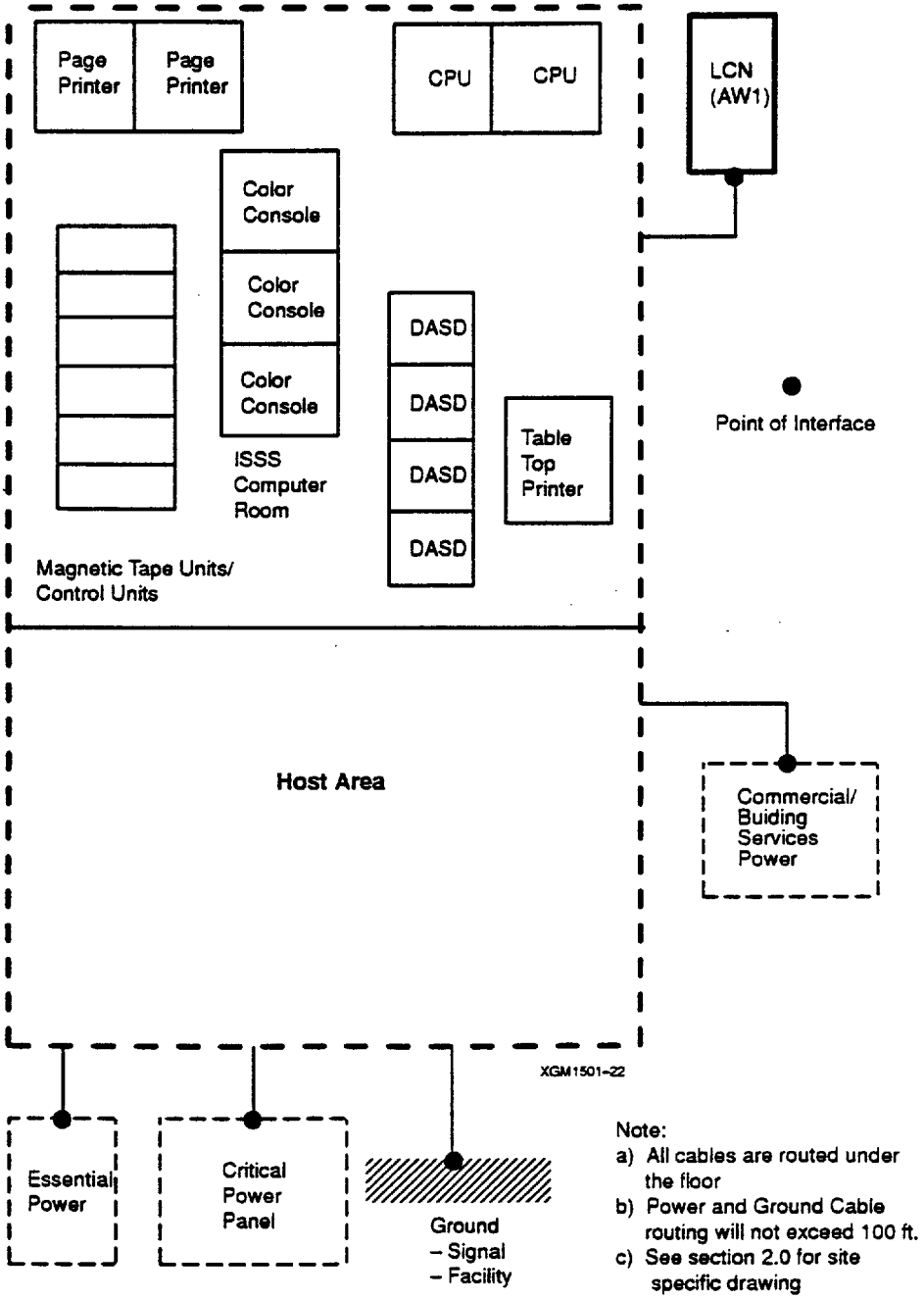


Figure 20-9. Power Connection Interface Diagram (Sample)

APPENDIX III

30. SUBSYSTEM/SUBSYSTEM INTERFACE CONTROL DOCUMENT PREPARATION

30.1 General preparation requirements for ICDs. The following general preparation requirements shall apply to all subsystem/subsystem ICDs.

30.1.1 ICD format. Each ICD shall conform, at a minimum, to the generic format presented in Figure 30-1 of this standard. An appendix may be used to provide information in an ICD when the interface design details are lengthy or otherwise do not fit the Figure 30-1 format. If an item required by the Figure 30-1 format is definitely not applicable to the interface design, it shall be identified by use of the term "Not Applicable." Figures shall be numbered using arabic numerals for the second digit (ie. 3-1, 3-2) and tables shall be numbered using capital Roman numerals for the second digit (ie, 3-I, 4-I).

30.1.2 ICD standards. ICDs shall be prepared in accordance with this appendix and FAA-STD-005. Drawings prepared to document the interface design characteristics shall comply with FAA-STD-002 and MIL-STD-100, as applicable. Schematics used in an ICD shall be drafted in accordance with MIL-STD-100 and shall utilize the symbology specified by IEEE 315 and IEEE 315A. Clarity and legibility shall meet the reproducibility requirements specified in FAA-STD-023.

30.1.3 Basic approach. Interface design characteristics shall be documented by use of drawings, tables, and written text. As used here, the term drawing includes figures, block diagrams, schematics, wiring diagrams, or any other form of government or industry accepted graphic representation approved by the FAA for use in interface documentation. The ICD shall completely document interface design characteristics, and shall show design compliance with specified interface requirements including those imposed by referenced documents.

30.1.4 Item specific drawings and tables. Item specific drawings and tables may be used to document interface design characteristics where the specified interface requirements are of sufficient complexity. Once a single drawing or table is used in an ICD, it may be referenced from any paragraph that contains interface design characteristics documented by that drawing or table. It is not necessary to reproduce the drawing/table for multiple references.

30.1.5 Headers. Each page of an ICD, including the front cover, shall contain a header in the upper right hand corner of that page. Each header shall contain the ICD number and the date of the ICD. If the ICD is a draft document, the word "DRAFT" shall follow the date and be represented in capital letters. ICD numbers shall be obtained from the FAA. If the ICD is a revision to a baselined ICD, the revision letter shall be included immediately

under the ICD number by use of the word "REVISION" in capital letters, followed by the revision letter of the ICD.

30.1.6 Page numbers. The cover of the ICD shall be considered to be the first page, although no page number shall appear on the cover. Page numbering shall begin on the Approval Signature Page. The Approval Signature, Revision Record, Effectivity, and Table of Contents pages shall be numbered using lower case Roman numerals. The Approval Signature page shall be numbered "ii," with the pages through the Table of Contents numbered sequentially. The page beginning with Section 1, SCOPE, shall be numbered as page "1" using Arabic numerals. The subsequent pages of the ICD, including appendices, shall also be numbered sequentially using Arabic numerals.

30.1.7 Paragraphing. This appendix uses the terms section, subsection, and paragraph in discussing the structural requirements for an ICD. The terms section and subsection are used in a conventional sense. The use of the term paragraph is far more liberal, and can mean a single paragraph or multiple paragraphs that are subparagraphs of a main paragraph. The author of an ICD shall subparagraph as necessary to present interface design in a logical, concise, and understandable manner. Each subparagraph shall be numbered.

30.2 ICD Publication requirements. The following publication requirements shall apply to all subsystem/subsystem ICDs.

30.2.1 Covers. Covers for ICDs shall be in accordance with the format presented in Figure 30-2. ICD covers shall be produced using FAA WA Form 4510-1. The ICD title shall identify the interfacing subsystems. In the case where the number of interfacing subsystems precludes listing each in the title, a generic title may be used.

30.2.2 Approval Signature Page. The Approval Signature page shall be the first interior page of an ICD, and be in accordance with the format presented in Figure 30-3. For fielded systems, modifications and revisions will be documented and controlled by the Regional Configuration Control Boards.

30.2.3 Revision record. The Revision Record page shall be in accordance with the format presented in Figure 30-4. The "REVISION LETTER" column shall show the revision letter assigned at the time of each incorporation. The "DESCRIPTION" column shall briefly describe the change that was incorporated. In the "DATE" and "ENTERED BY" columns, approval signatures shall be affixed and dated for each revision letter entry.

30.2.4 Effectivity. Effectivity pages will not be included in ICDs. The location of equipment will be as specified in NAS System Specification (NAS-SS-1000) Volume I, Appendix II.

30.2.5 Table of Contents. The Table of Contents shall outline the contents of the document by sections and paragraphs. Their respective title and page number shall be listed in parallel columns in the order in which they appear in the document. The Table of Contents shall be in accordance with the format presented in Figure 30-6.

30.3 Section 1, SCOPE. The contents of this section shall be as defined in the following paragraphs.

30.3.1 Subsection 1.1, Scope. The scope shall consist of a brief summary of the contents of the ICD and its intended purpose. At a minimum, the scope shall contain the following sentences: "This ICD provides the design characteristics for an interface between the [subsystem] and the [subsystem]. This ICD satisfies the interface design requirements contained in [requirements document number and title]."

30.3.2 Subsection 1.2, Subsystem responsibility list. The subsystem responsibility list shall appear immediately after the scope. It shall consist of a list of the interfacing subsystems with their respective common names and the responsible contractor/FAA program office for the detailed design specification.

30.4 Section 2, APPLICABLE DOCUMENTS. Applicable documents shall be listed in accordance with FAA-STD-005. The contents of this section shall be as defined in the following paragraphs.

30.4.1 Subsection 2.1, Government documents. Government source documents (standards, specifications, publications, etc.) referenced in the ICD shall be listed. Government interface documentation referenced by this ICD shall also be listed here under the category of "OTHER PUBLICATIONS."

30.4.2 Subsection 2.2, Non-government documents. Non-government source documents referenced in the ICD shall be listed.

30.5 Section 3, INTERFACE DESIGN CHARACTERISTICS. This section of the ICD shall document the interface design characteristics between subsystems. Performance and interface peculiar man-machine design characteristics shall also be included. Design characteristics shall be documented to the extent necessary to define the characteristics of the interface design and to show compliance with interface requirements.

30.5.1 Subsection 3.1, General requirements. This subsection shall distinctly identify the interfacing subsystems, the point of interface, and functions/services provided by the interface.

30.5.1.1 Subsection 3.1.1, Man-machine interface requirements. Describes any man-machine interface (MMI) and computer-human interface (CHI) requirements not specified elsewhere in the IRD.

30.5.2 Subsection 3.2, Functional design characteristics. This subsection of the ICD shall specify the functional design characteristics for the interface as described in the following paragraphs. Functional design characteristics are for example identified in three categories of interfaces: OSI-type (data); Analog-type (Voice); and Discrete-type (Radio). Performance characteristics and the tolerances those characteristics meet shall be documented to the extent that they are appropriate to the functional characteristic being documented. This subsection, Functional design characteristics, is required in each ICD written to this standard, and the contents will vary based on the purpose that the interface is intended to fulfill.

30.5.2.1 Subsection 3.2.1, How to specify requirements for interfaces involving user applications processes. Interfaces involving computer processing of user application information shall specify the applciation Process(es) (AP) that will be present in the interface (reference Section 6.1, Definitions, for the definition of "Application Process"). The following types of requirements shall be specified for Application Processes to the degree that they are to be present.

30.5.2.1.1 Subsection 3.2.1.1, Identification of each Application Process. Identify and describe each Application Process present in the interface. A descriptive name may be provided.

30.5.2.1.2 Subsection 3.2.1.2, Types of service required by the Application Process. Describe the kind of service(s) required by the AP (e.g. message transfer, file transfer, data base inquiry, weater graphics, surveillance, sensor, etc.). Specify the National Airspace System (NAS) category of service; critical, essential, or routine.

30.5.2.1.3 Subsection 3.2.1.3, Information units. Identify the units of information that may be transferred across the interface (e.g. messages, requests, acknowledgements, files, sensor and surveillance data messages, error messages, control messages, reports, etc.). If message type numbers have been associated with the information units, they should be listed to provide traceability. Specific information unit types (e.g. specific message types) should be identified. Specify the following requirements for each information unit.

a. Information code/structure - Identify the representation and structure of the information exchanged between the APs (e.g. ASCII, binary, graphic, etc.) Include the format for each information unit specifying the fields and field lengths. This may be indicated in an appendix.

b. Information unit segmentation - Specify any segmentation required of the AP for each information unit. Include the maximum and minimum information unit sizes.

c. Information flow - Indicate the direction of flow of each information unit (e.g. indicate initiator/responder of the information unit. Describe the procedures for initiating and responding to each information unit.

d. Frequency of transmission - Indicate scheduled and unscheduled information unit transfer (include the times for the scheduled transfers and the average number of transfers per unit of time for the unscheduled transfers). Include maximum requirements that can occur (e.g., peak transmission frequency).

e. Responses - Indicate if responses (including acknowledgements) are required for specific information unit transfers. Specify the response (e.g. the specific information unit type) and the response timer values. Indicate the maximum time allowed for receipt of an expected response.

30.5.2.1.4 Subsection 3.2.1.4, Quality of Service (QOS) Quality of service parameters are the end-to-end services requried of OSI as defined in FAA-STD-039. These can include:

a. Priority - "Indicate the relative importance of each information unit type in relation to other unit types processed by communicating NAS APs. NAS applications shall use the AP priority indicators specified in FAA-STD-043 in this section when exercising the priority option specified in application layer protocol standards used by the NAS.". The information priority

capabilities of the lower OSI layers have nothing to do with AP information priority.

b. Security - Indicate any security requirements such as protection from unauthorized access to specific information.

c. Residual Error Rate - The ratio of total incorrect, lost and duplicate data units to the total data units transferred across the network service boundry during a measured period.

d. Transfer time constraints - Specify any performance requirements for the Application Process(es). Include any maximum transfer times for each information unit.

e. Throughput - The number of data units transferred divided by the time between first and last.

30.5.2.1.5 Subsection 3.2.1.5, AP Error handling. Error handling procedures of the AP should be specified as required. Clarify what constitutes an error condition. The error handling capabilities of the lower OSI layers are unrelated to the AP error handling process.

30.5.2.1.6 Subsection 3.2.1.6, Interface Summary table - An interface summary table (reference Figure 10-7) shall be used to establish links between the messages that flow across the interface and the functions (Application Processes) by each of the interfacing and systems. The interface sumary table shall consist of three columns. The left column shall list the Source, Application Process, and the subprocesses. The middle column shall contain the names of the messages connected to a subprocess and the reference praragraph. The right hand column shall list the Sink, the Application Process and the subprocess.

For the interfacing subsystems listed in the left and right columns list as follows.

a. For each software source and sink function, the interface summary table shall designate an application Process by name and a matching Application Process for the interfacing subsystems.

b. For each Application Process, the interface summary table shall designate a set of one or more subprocess(es) corresponding to subfunctions that originate or terminate specific data communications. For convenience, the subprocess(es) should be sequentially numbered as a subset within the Application Process numbering.

c. For each pair of subprocesses, one or more specific message shall be listed. Each message shall represent a functional link between a pair of subprocesses listed as the logical interface for the two subsystems.

d. For any Application Process, subprocess, or message that cannot be identified, entries in the table shall be marked "TBS".

30.5.2.2 Subsection 3.2.2, OSI-type (data) interface. Functional characteristics shall be documented for an OSI-type interface, where applicable, for each layer of the International Organization for Standardization (ISO)/OSI model invoked. Appendix VI provides a description of these layers. FAA-STD-039 establishes a data communications architecture and defines the protocol standards for open systems communications within the NAS. The architecture defined in FAA-STD-039 is based on the seven layers. This subsection of the ICD shall be written in accordance with FAA-STD-039 and Appendix VI. The contents of this subsection, shall address each of the following seven OSI layers listed as required.

3.2.1	Application Layer
3.2.2	Presentation Layer
3.2.3	Session Layer
3.2.4	Transport Layer
3.2.5	Network Layer
3.2.6	Data Link Layer
3.2.7	Physical Layer
3.2.7.1	DTE to DCE Interconnection
3.2.7.2	DTE to DCE Interconnection with Intermediate Equipment
3.2.7.2.1	DTE to Intermediate Equipment
3.2.7.2.2	DCE to Intermediate Equipment
3.2.7.2.3	DTE to DTE

30.5.2.3 Subsection 3.2.3, Analog-type interface (Voice). The functional characteristics for an analog-type interface in accordance with FAA-STD-029 shall document the number of analog signal paths required in each direction; the nature of the signals (e.g. voice band audio); functional characteristics for switching, control, and supervisory signaling; and the common electronic characteristics of the analog signals to be accommodated by the communications link or network that serves the interface (e.g. frequency bandwidth, impedance, signal level, noise and distortion limits, etc.). Any other characteristics (for signal processing, signaling, call set-up, etc.) that pertain to the analog portion of the interface shall also be documented.

30.5.2.4 Subsection 3.2.4, Discrete-type interface (Radio). The functional characteristics for a discrete-type interface in accordance with FAA-STD-029 shall document the number of control signal paths to be used in each direction; functional characteristics for switching, signaling, etc.; functions controlled on each signal path (e.g. "receiver mute" or "automatic gain control"); the common electrical characteristics (e.g. voltage, polarity,rise time, frequency, pulse rate, etc.) to be accommodated by the communications link or network which serves the interface; and any other characteristics that pertain to the discrete control signal portion of the interface.

30.5.2.5 Subsection 3.2.5, Interface design characteristics table. In addition to documenting the functional characteristics of the interface in the textual format required by the previous paragraphs, interface functional characteristics shall also be summarized in an interface design characteristics table or matrix. The interface design characteristics table will serve as a "quick-look" reference. Included shall be message identification (e.g. number, name, etc.); format type; message sizes (whether fixed or variable lengths); frequency/rate of transmission. The reference source for messages mandated by international treaties, agreements with government agencies, etc. shall also be included (reference Figure 30-8).

30.5.3 Subsection 3.3, Physical design characteristics. In certain cases where one or more of the subsystems supplies electrical/mechanical/environmental support to another subsystem, the physical design characteristics must be documented in an ICD as described in the following paragraphs. Performance characteristics and the tolerances those characteristics meet shall be documented to the extent that they are appropriate to the functional characteristic being documented. Interfacing subsystems shall be specified in their installed (or "mated") condition. In addition, the "halves" of the interface shall be separated and specified in detail views. Only that portion of the hardware that is applicable to the interface needs to be identified. Each component or part shall be identified with the participant responsible for supplying it.

30.5.3.1 Paragraph 3.3.1, Electrical power/electronic characteristics. This paragraph of the ICD shall document the electrical power/electronic characteristics associated with the interface. Electrical power characteristics are those which relate to the transfer of primary-type power between subsystems. Electronic characteristics are those which relate to the process of signaling, controlling, or transferring information. Interconnecting cables shall be identified by reference number and supplier.

30.5.3.1.1 Subparagraph 3.3.1.1, Connectors. This paragraph of the ICD shall document the connectors used in the interface. The mechanical characteristics to be documented shall include size, pin/socket configuration, keyway indexing and tolerance, materials, finish, and torque. Electrical characteristic documented shall include pin-to-pin isolation, breakdown voltage, contact resistance, dielectric properties, conductivity, and bonding. Connectors shall be specified in their "mated" condition with the wiring configuration of each half defined. Signal/function-to-pin assignments shall be defined for each connector half to assure proper connection of the circuits involved. All wires, including jumpers, splices, spares, etc. shall be identified. All unconnected pins, including uninstalled pins, shall also be identified. These documented characteristics may be satisfied through the use of a combination of drawings, tables, and written text.

30.5.3.1.2 Subparagraph 3.3.1.2, Wire/cable. This paragraph of the ICD shall document wire type, American Wire Gage (AWG) conductor size, conductor material, jacket material, insulation voltage rating, color code, etc. Wire lengths, maximum resistances, cable capacitance, characteristic impedance, etc., shall also be documented. When cable routing is critical to maintain electromagnetic compatibility or pulse isolation, special notes, twist characteristics, views etc., shall be included.

30.5.3.1.3 Subparagraph 3.3.1.3, Electrical power/electronic referencing (grounding). This paragraph of the ICD shall document how each circuit is connected to the common electrical reference(s) for power and signals. This paragraph is required only if the subject material is not specified in the physical layer.

30.5.3.1.4 Subparagraph 3.3.1.4, Fasteners. This paragraph of the ICD shall document the fasteners to be used to assemble interfacing components. Characteristics to be documented shall include head type, size, diameter, tolerance, thread definition, length, material, finish, and torque/ installation values.

30.5.3.1.5 Subparagraph 3.3.1.5 Electromagnetic compatability. This paragraph shall document the specific limits on signal transmission characteristics, radar interference, and communications interference.

30.6 Section 4, QUALITY ASSURANCE PROVISIONS. Section 4 shall contain the following statements:

a. "Each project is required to perform conformance testing."

b. "Each project is required to perform interoperability testing at a FAA-approved test facility."

30.7 Section 5, PREPARATION FOR DELIVERY. This section of the ICD shall document any special preparations for delivery.

30.8 Section 6, NOTES. This section of the ICD shall contain information used to describe unique operational concepts or exceptional details that amplify implementation of the operational concept contained in the requirements documents.

30.8.1 Subsection 6.1, Definitions. This subsection shall list the definitions of unusual technical terms used in the ICD.

30.8.2 Subsection 6.2, Abbreviations and acronyms. This subsection shall contain a definition of all abbreviations and acronyms used in the ICD.

30.8.3 Subsection 6.3, Key word index. This subsection shall list any key words or phrases used in the ICD for reference to the interfacing subsystems.

IRD FORMAT OUTLINE	
Cover	
Approval Signature Page	
Revision Record	
Effectivity Page	
Table of Contents	
1.	SCOPE
1.1	Scope
1.2	Subsystem responsibility list
2.	APPLICABLE DOCUMENTS
2.1	Government documents
2.2	Non-government documents
2.3	Document Sources
3.	INTERFACE REQUIREMENTS
3.1	General requirements
3.1.1	Man machine interface requirements
3.2	Functional requirements
3.2.1	How to specify requirements of interfaces involving user applications process
3.2.1.1	Identification of each application process
3.2.1.2	Types of service required by the Application Process
3.2.1.3	Information units
3.2.1.4	Quality of Service (QOS)
3.2.1.5	AP Error Handling
3.2.1.6	Interface Summary Table
3.2.2	OSI-Type data interface
3.2.3	Analog-type interface

Figure 30-1. ICD Format Outline
Page 1 of 2

3.2.4	Discrete-type Interface (Radio)
3.2.5	Interface Requirements Table
3.3	Physical requirements
3.3.1	Electrical power/electronic requirements
3.3.1.1	Connectors
3.3.1.2	Wire/cable
3.3.1.3	Electrical power/electronic referencing (grounding)
3.3.1.4	Fasteners
3.3.1.5	Electromagnetic Compatibility
4.	QUALITY ASSURANCE PROVISIONS
4.1	General
4.2	Responsibility for verification
4.3	Special verification requirements
4.3.1	ISO Conformance
4.3.2	ISO Interoperability
4.3.3	Non-ISO Interoperability
Table 4-x	Verification Requirements Traceability Matrix
4.4	Verification levels and methods
4.4.1	Verification levels
4.4.2	Verification methods
5.	PREPARATION FOR DELIVERY
6.	NOTES
6.1	Operational concept
6.2	Definitions
6.3	Abbreviations and acronyms
6.4	Key word index

Figure 30-1. ICD Format Outline

[ICD Number]
[Rev Letter]
[Date]

U.S. Department of Transportation
Federal Aviation Administration
Interface Control Document

[Interfacing Subsystem/Subsystem]

Figure 30-2. ICD Cover Page (FAA WA Form 4510-1)

[ICD Number]
[Rev Letter]
[Date]

INTERFACE CONTROL DOCUMENT

APPROVAL SIGNATURE PAGE

[Interfacing Subsystem/Subsystem]

APPROVAL SIGNATURES		
PARTICIPANT	NAME	DATE
[CONTRACTOR A]		
[CONTRACTOR B]		
[PROJECT A - Program Manager]		
[PROJECT B - Project Manager]		

Figure 30-3. ICD Approval Signature Page

			[ICD Number] [Rev Letter] [Date]
REVISION RECORD			
REVISION LETTER	DESCRIPTION	DATE	ENTERED BY

Figure 30-4. ICD Revision Record

Figure Not Used

Figure 30-5

[ICD Number]
[Rev Letter]
[Date]

TABLE OF CONTENTS

Figure 30-6. ICD Table of Contents

Source	Message	Ref Para	Sink
End System			End System
Application Process			Application Process
Subprocess			Subprocess
Subprocess			Subprocess

GM1521A-1

Figure 30-7. Example Interface Summary Table

Application Process Name	Message Name	Message Function Code (Hex Code)	Message Flow ACCC ◄► MPS	Estimated Message Frequency	Message Size (Bytes)	Maximum Transfer Time Constraints (seconds)
Maintenance Status Data Processing	Alarm	41	→	101/yr	Variable; 2048 max	1.5
	Alert	61	→	626/yr	Variable; 2048 max	1.5
	State Change	43	→	10.0/day	Variable; 2048 max	1.5
	Return to Normal	42	→	as necessary	Variable; 2048 max	1.5
	NAS Subsystem Status Request	4C	→	128/day	Fixed; 4 max	1.5
	NAS Subsystem Status Data	4D	←	.128/day	Fixed; 16 max	1.5
	Subsystem Status Command	4A	←	128/day	Fixed; 4 max	1.5
	Subsystem Status Data	4B	→	128/day	Variable; 778 max	1.5
Error Data Processing	Invalid Request/ Command	45	◄►	as necessary	Variable; 2,048 max	1.5

Figure 30-8. Example Interface Design Characteristics Table

APPENDIX IV

40. INTERFACE REVISION PREPARATION

40.1 Interface Revision (IR) applicability. An IR shall be used to change an Interface Requirements Document (IRD) or an Interface Control Document (ICD). Reasons for originating an IR include:

a. Corrections to drafting or typing errors;

b. Improving or expanding interface requirements/definition;

c. Adding information to complete an incomplete document;

d. Bringing a document into accordance with actual design or operation;

e. Incorporation of requirement or design changes to resolve interface incompatibility; and

f. Documenting changes in interfaces.

40.2 General preparation requirements for IRs. The following general preparation requirements shall apply to all IRs.

40.2.1 IR format. Sheet 1 of an IR shall conform to the format illustrated in Figure 40-1. Any additional IR pages required shall use the continuation form illustrated in Figure 40-2. Plain 8-1/2 by 11 or larger pages may be used to replace complete pages or to change large pictorial areas.

40.2.2 Standard IR information. In addition to the IR change description identified in paragraph 40.2.3, all IRs shall contain "standard information". Requirements for the generation of this information are outlined as follows. Each block in Figures 40-1 and 40-2 reflect the following paragraphs which describe the entries to be made in the respective block.

40.2.2.1 Document number. The number of the document being revised.

40.2.2.2 Document title. The title of the document being revised.

40.2.2.3 Document page/vol number. Document volume and/or page number as applicable.

40.2.2.4 IR number. An IR number may be used only once. The same number shall appear on each sheet of the IR.

40.2.2.5 IR page. The sequence number of the IR page. On page one only, '1' will be followed by the total number of pages in the IR (e.g. '1 of 10'). On a single page IR, use "1 of 1".

40.2.2.6 Revision letter. This block shall be left blank. At the time of IR incorporation the document originator shall identify the revision letter under which the IR was incorporated.

40.2.2.7 Approval blocks. The IR originator and the same approval signatures as required on the document, listing the IR originator first.

40.2.2.8 Reason. This block shall contain a concise description of the reason for the IR.

40.2.3 IR change description. The body of the IR shall contain a detailed description of the changes to be made to the document. Each change shall be itemized, by number, on the IR form. The identifier and location of each change shall be specified; for book-form documents specify the page, paragraph, figure, etc. Change descriptions to drawings, figures, etc. shall be identified in detail. Previously unincorporated IRs shall be referenced if the change affects or cancels something added/changed by those IRs.

An accurate description of each change shall be specified with any special instructions for site incorporation:

a. If the change modifies an existing interface description, both the old and new configuration shall be identified using the words "was" and "now," respectively.

b. When an entire paragraph is to be changed the following instruction shall be used: "Revise paragraph to read as shown".

c. If the change involves new information only, the instruction word "delete" shall be used.

d. If a complete revision is to be accomplished the following instructions shall be used: "DOCUMENT COMPLETELY REVISED" or "PREVIOUS RELEASE IS OBSOLETE".

40.2.3.1 IR reference notes. IR references shall be used when it is necessary to include instructions or information on an IR other than the actual document change itself. The reference material shall be identified as "IR reference only; not for incorporation in document change". IR reference material shall not be incorporated.

40.2.3.2 Book-form replacement pages. If a change involves most of a book-form page, a replacement original page may be prepared and included as part of the IR. The IR number and IR sheet number shall be penciled in at the top of the page. When replacement pages are provided, the following instruction shall be used in the IR change description: "Replace document page [x] with page [y] of the IR".

40.2.3.3 Oversize pages. If a change description for a drawing requires more space than is available on the 8-1/2 x 11 IR form, larger pages may be used to supplement the IR. Pages used in this manner shall carry the IR number and an appropriate IR page number. Change descriptions made on supplemental IR pages shall be referenced by appropriate instruction words on the basic IR form (e.g. "Make changes as described on page 3 of this IR"). At least a 1/2-inch margin shall be maintained on all sides of supplemental IR pages.

ORGANIZATION	APPROVED	DATE

NAS

INTERFACE REVISION

Department of Transportation
Federal Aviation Administration

DOCUMENT NUMBER

DOCUMENT TITLE

DOCUMENT PAGE
VOL NUMBER

IR NUMBER

IR PAGE

REV LTR

REASON

Figure 40-1. Interface Revision Form

NAS INTERFACE REVISION CONTINUATION				
[40.2.2.7]		[40.2.2.1]	[40.2.2.3]	[40.2.2.4] [40.2.2.5]
[40.2.3]				

Figure 40-2. IR Continuation

APPENDIX V

50. ISO/OSI IMPLEMENTATION

The term Open System Interconnection (OSI) qualifies standards for the exchange of information among systems that are "open" to one another for this purpose by virtue of their mutual use of the applicable standards.

"The fact that a system is open does not imply any particular systems implementation, technology, or means of interconnection, but refers to mutual recognition and support of the applicable standards."

"The general structure of the OSI architecture described in FAA-STD-039 provides architectural concepts from which the Reference Model of Open Systems Interconnection has been derived, making specific choices for the layers and their contents.

The Reference Model contains seven layers:

a) the Application Layer (Layer 7);
b) the Presentation Layer (Layer 6);
c) the Session Layer (Layer 5);
d) the Transport Layer (Layer 4);
e) the Network Layer (Layer 3);
f) the Data Link Layer (Layer 2); and
g) the Physical Layer (Layer 1).

These layers are illustrated in Figures 50-1. The highest is the Application Layer and it consists of the application-entities that cooperate in the OSI environment. The lower layers provide the services through which the application entities cooperate.

Layers 1 to 6, together with the physical media for OSI provide a step-by-step enhancement of communications services. The boundary between two layers identifies a stage in this enhancement of services at which an OSI service standard is defined, while the functioning of the layers is governed by OSI protocol standards [as given in FAA-STD-029 and FAA-STD-039].

In the functional requirements section of an Interface Requirements Document (IRD) (reference Appendix I, Subsection 10.5.2) it is necessary to describe each of the layers that are used in the subsystem/subsystem implementation. It would be preferred if each IRD list all seven layers. If the design does not have or will not have one or more layers, it is, as previously stated, a closed system. In treating those absent layers the statement "This layer is not implemented" can be used.

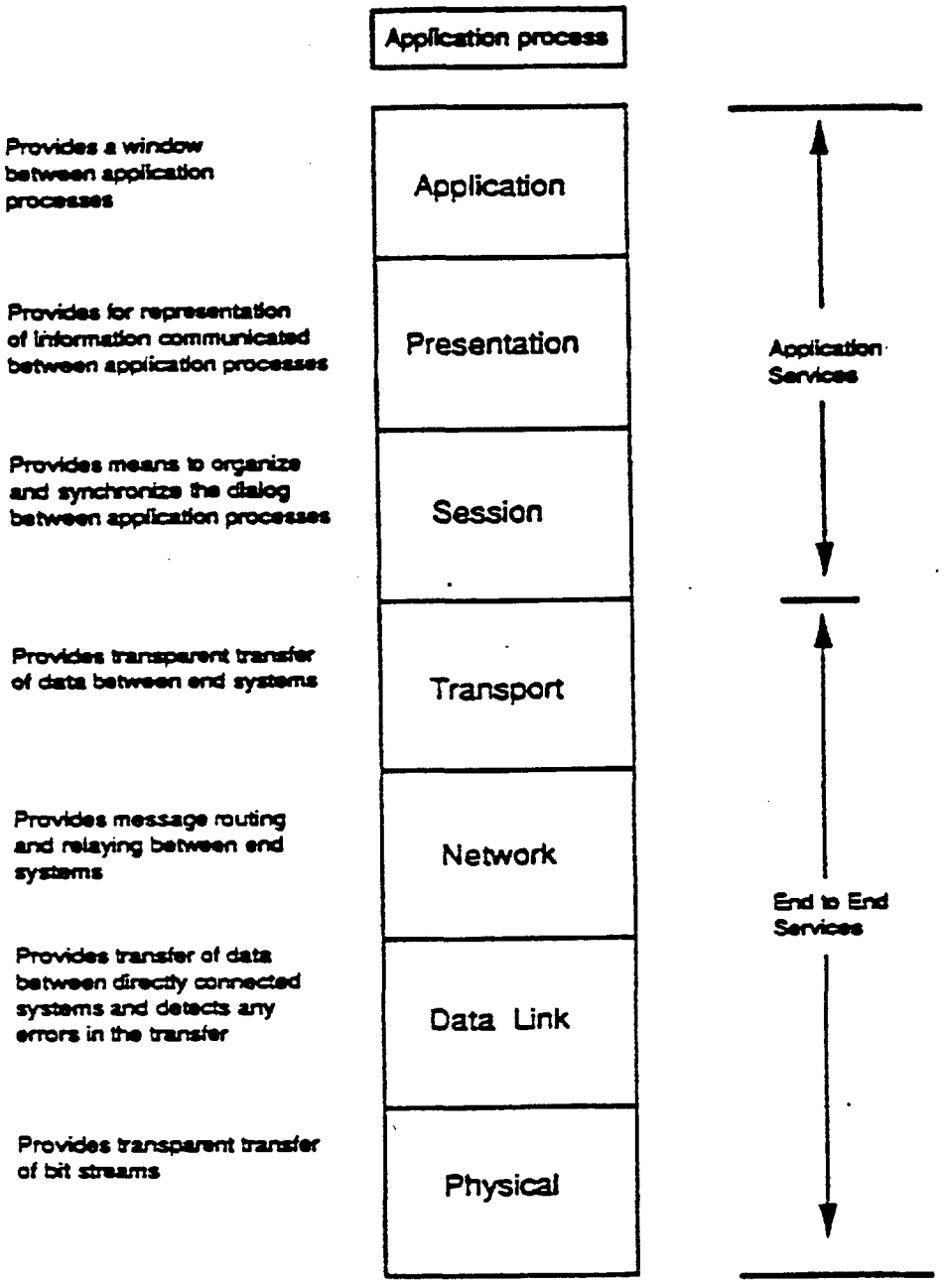


Figure 50-1. OSI Basic Reference Model

Appendix VI DEVELOPMENT GUIDE FOR INTERFACE REQUIREMENTS DOCUMENT (IRD) AND INTERFACE REVISION (IR)

60.1.0 INTRODUCTION.

60.1.1 PURPOSE. This document has been developed as a brief introduction to the interface management process, and as a guide for developing Interface Requirements Documents (IRD) and Interface Revisions (IR). It is intended for both new authors as well as those who have previously developed IRDs and IRs.

60.1.2 SCOPE. This guide is not meant to be all encompassing, but it does include sources for obtaining the information necessary for the development of IRDs and IRs and identifies the organizations with which to coordinate the effort.

60.1.3 DEFINITIONS.

IRD - A formal agreement which documents the requirements and specifications for an interface; and contains functional, performance, and verification requirements.

IR - a change to a previously developed IRD that is under configuration control.

ICD - A formal agreement which documents how the interface requirements are implemented in the design of the subsystem.

60.1.4 OVERVIEW. An IRD establishes formal agreement among projects and documents design requirements for interfaces between subsystems, external systems, or a subsystem and its supporting facility. The IRD, except facility IRDs, becomes part of the procurement package to the contractors to ensure that the contractors are designing toward a mutually understood interface.

An IRD may be started at any time in the early phase of the involved project's acquisition; however, baselined IRDs are required prior to finalizing a project's Statement of Work (SOW) and Request for Proposal (RFP). As a rule, IRDs are not normally written for systems where Interface Control Documents (ICD) are available. The development of an IR, a change to a previously developed IRD, can occur anytime after an IRD is baselined.

The procedures and processes contained in this guide can be used by any developer of IRDs/IRs; i.e., the Federal Aviation Administration (FAA), the System Engineering and Integration (SEI) contractor, and other contractors.

Specific procedures may vary depending on where the document is initiated. The overall IRD/IR process is described in FAA Order 1800.8e, National Airspace System Configuration Management.

60.2.0 IRD/IR DEVELOPMENT AND APPROVAL PROCESS

60.2.1 IRD DEVELOPMENT AND APPROVAL PROCESS DESCRIPTION. The IRD process begins with the identification of an interface in the NAS-DD-1000 or NAS-SS-1000. The need for an IRD is based on factors such as the maturity of the subsystems involved--e.g., has the project released an RFP, or undergone preliminary design review (PDR) or critical design review (CDR); or whether other documentation such as ICDs would be more appropriate.

The IRD is developed, based on the requirements specified in the NAS-SS-1000, to define the requirements necessary for an interface between two subsystems, a subsystem and an external system or between a subsystem and the facility. The interface engineer/author selected to draft the IRD must coordinate with the project managers, System Engineering, Interface Management (IFM), verification and test, and others appropriate to the interface while drafting the document. Technical interchange meetings (TIMs) may be necessary to ensure complete and correct definition of requirements. Once the author has completed a draft, it is submitted to IFM for a final review prior to coordination. A casefile should be prepared at this time. Early coordination with IFM is necessary for documents prepared by other than the FAA or SEIC to help expedite the process.

IRDs that are prepared by SEIC personnel are presented by the engineer/author for coordination through the SEIC document review process National Airspace System Standard Procedure 2.6 (NAS SP 2.6). The document is then reviewed by SEI personnel who can provide pertinent information about the interface and comments are returned to the author for resolution. Some comments may require a TIM for resolution. When all comments have been addressed, the IRD is presented to the Pre-review Board (PRB). In some cases an unresolved comment will be presented to the PRB for resolution. Once the IRD passes PRB, it is presented to the Program Assessment Review Board (PARB) for final approval and submittal to the FAA. Once an IRD has passed the PARB, it has completed the NAS SP 2.6 process.

The author is responsible for the IRD until it has been approved by the System Engineering (SE) Configuration Control Board (CCB).

Once the NAS SP 2.6 process has been completed, the casefile is entered into the NAS configuration management (CM) system. The case file and IRD are forwarded to ASE-600 for pre-screen. The document is reviewed by the pre-screening office and comments are resolved prior to the document leaving pre-screen for "must" evaluation. The case file is signed, "must" evaluators are selected, and a due date for "must" evaluator comments is assigned. The case file is then delivered to Configuration Management (CM) where it is assigned a National Airspace System (NAS) Change Proposal (NCP) number, entered in Document Control (DOCCON), and distributed to the "must" evaluators.

The IRD is now in the "must" evaluator process. The document is reviewed by FAA organizations impacted by the interface in question. Several Interface Control Working Group (ICWG) meetings may be required before the IRD can be finalized. Once all comments have been resolved, the IRD is signed, usually

at a specially convened ICWG, and the document and supporting documentation are returned to configuration management.

Signatures on the IRD/IR signature page means that the requirements are technically correct, and both projects agree that they can be implemented.

Signing a IRD/IR does not mean that funding, schedule, System Level Specification (SLS) changes, etc. are resolved. These are only resolved by the NAS Change Proposal (NCP), and data attached to it, that must be approved by the NAS or SE CCB's, depending on dollars involved and kind of changes that the IRD/IR may be part of. IT has to be kept in mind that the approval of the NCP does not get the dollars, only approves the need for them. A Financial Baseline Change Notice (FBCN) has to be done to get the actual dollars into the financial baseline.

The IRD is then presented to the appropriate CCB for baselining and, after approval, a configuration control decision (CCD) is written to finalize the document.

A flow chart of this process is shown in Figure 60-1.

60.2.2 IR DEVELOPMENT AND APPROVAL PROCESS DESCRIPTION. The process for baselining an IR is nearly identical to the IRD process, the only difference being the reason IRs are developed. The reason for developing an IR is to revise an baselined IRD. This process is also reflected in Figure 60-1. Following approval at the SE CCB, the IR is merged into the baselined IRD to produce a revised baselined IRD.

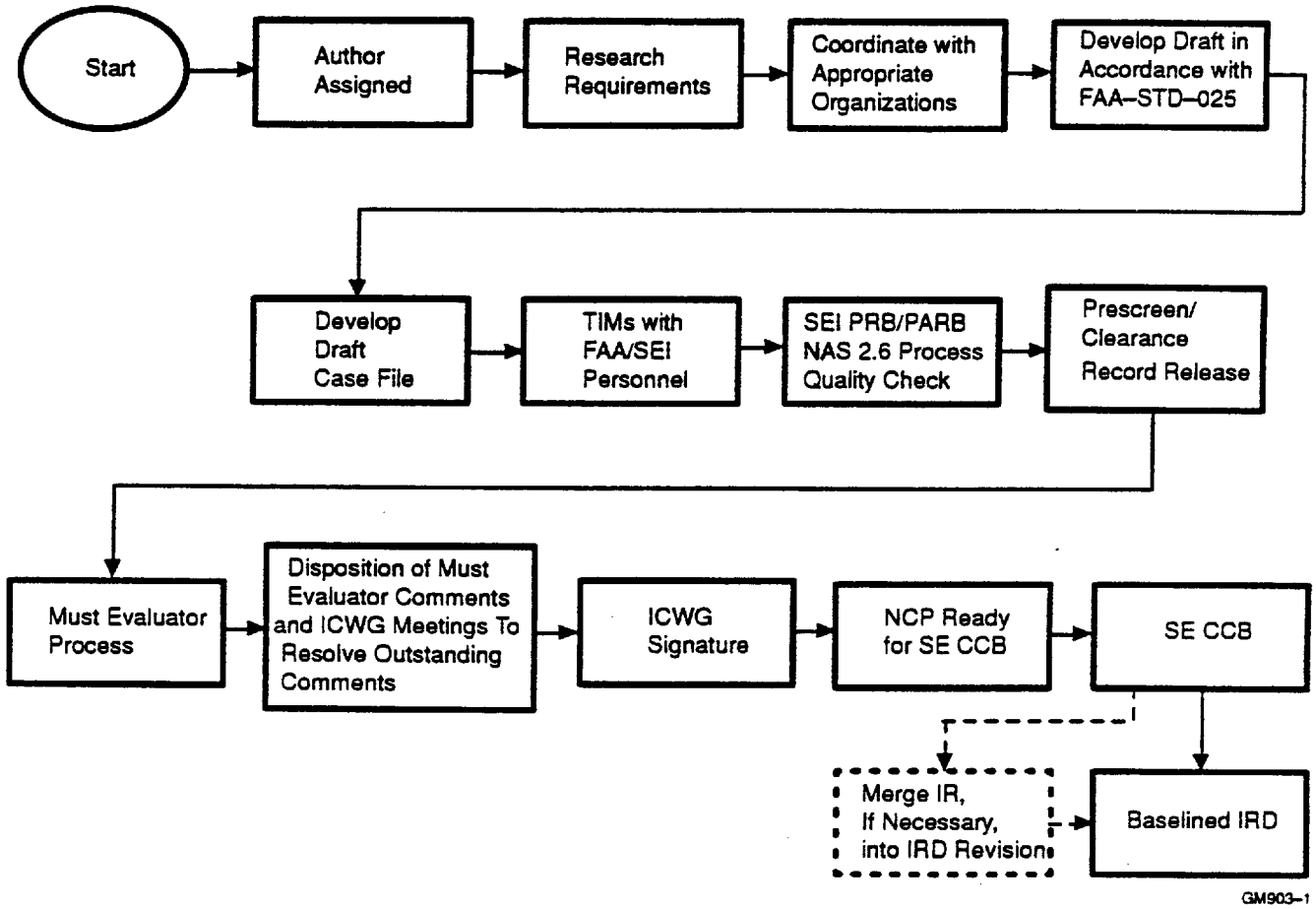


Figure 60-1 IRD/IR Development and Approval Process

60.2.3 INDIVIDUAL/ORGANIZATIONAL RESPONSIBILITIES

60.2.3.1 Interface Engineer/Author. The interface engineer/author is the document originator, responsible for writing the IRD and the accompanying casefile and ensuring that the requirements stated in the document are valid. The author must coordinate with the involved project managers as well as system engineering and interface management to ensure proper documentation of requirements. The author may have to hold TIMs or table-tops to obtain agreement from all interested parties.

The author then presents the final draft to IFM for review prior to entering the NAS SP 2.6 process. The author will present the document to the PRB and PARB and will be required to resolve comments received via NAS SP 2.6, pre-screen, or the must-evaluator process. The author's attendance at meetings such as pre-board, PARB, ICWGs, etc., will be required to support the document through the approval process to SE CCB.

60.2.3.2 Interface Management (IFM). Interface Management is the group/function within Systems Engineering that is the Facilitator for the IRD/IR process. IFM must review the subject IRD for style and format, ensuring traceability to system documentation (e.g. NAS-SS-1000), and is responsible for coordinating the document through the review cycle (2.6), pre-screen, and must evaluation. IFM assigns must evaluators to the clearance record for the must-evaluator process and is responsible for scheduling ICWGs, or TIMs during the must-evaluator process as well as chairing these meetings. The engineer/author is responsible for ensuring that all comments are properly resolved and that the document is in final form for presentation to the SE CCB.

60.2.3.3 Project Management (PM). Project Management is responsible for ensuring that all project requirements for the interface are properly defined and that the IRD is used as the agreement for communicating these requirements. PM has one formal and several informal opportunities to make comments on the IRD. PM is required to attend meetings associated with the IRD and to sign the completed document to indicate concurrence with it.

60.2.3.4 System Engineering (SE). The SE divisions are responsible for ensuring that the requirements in the IRD are consistent with system documentation and sufficiently detailed at the NAS system level. SE has the same opportunities to comment on the IRD as does the PM.

60.2.3.5 Configuration Management (CM). Configuration Management's role is to ensure that all documentation necessary for the SE CCB to make a decision on the IRD is included in the NCP package. CM, upon approval by the SE CCB, writes a CCD to indicate formal baselining of the IRD. Copies of the IRD are then sent to the Document Control Center (DOCCON) as well as distributed to appropriate organizations.

60.3.0 TYPES OF INTERFACES.

60.3.1 NAS SUBSYSTEM-TO-SUBSYSTEM INTERFACE. NAS subsystems interface with other NAS subsystems [e.g., Real-time Weather Processor (RWP) to Area Control Computer Complex (ACCC)] and to subsystems external to NAS [e.g., DOD interfaces]. These interfaces are hardware/software interfaces with the subsystems being connected directly or via a NAS communication subsystem(s) [e.g., NADIN PSN]. There are three levels of maturity of subsystem interfaces:

1) An immature subsystem interface is one in which at least one side of the interface does not have well-defined requirements. IRDs developed for this type of interface are normally baselined only when the IRD is required to satisfy the contractual requirement of one of the subsystems.

2) A mature subsystem interface has well-defined requirements on both sides of the interface. IRDs developed for this type of interface are normally baselined as part of the requirements definition documentation cycle.

3) A transitional interface is an interim interface between subsystems until the NAS-SS-1000 baselined subsystems become available. IRDs developed for this type of interface are normally baselined to satisfy the contractual requirements for one or both of the systems that will not be present in the end state NAS.

60.3.2 NAS SUBSYSTEM-TO-FACILITY INTERFACE. NAS subsystems within a facility that require floor space, specific environmental control, electrical power, grounding, etc., have an interface to the facility [e.g., RWP to Area Control Facility (ACF) or Terminal Doppler Weather Radar (TDWR) to Air Traffic Control Tower (ATCT)]. These interfaces are hardware interfaces. A subsystem-to-facility IRD is developed to document the requirements for these interfaces. It is used by the facility contractor to develop the facility design requirements and by the subsystem vendor to develop "not-to-exceed" requirements.

60.3.3 NAS SUBSYSTEM-TO-USER INTERFACE. NAS subsystem-to-user interfaces are those where a particular subsystem interfaces to more than one other subsystem.

A "user" system IRD is a generic IRD in which requirements are applicable to several interfaces. Instead of having several IRDs calling out the same set of communications service or remote monitoring subsystem (RMS) requirements, a generic IRD is created and referenced by the subsystem IRD when the requirements are applicable [e.g., Local Communications Network (LCN) and National Airspace Data Interchange Network (NADIN) Packet Switched Network (PSN)].

60.4.0 IRD/IR DEVELOPMENT.

60.4.1 SOURCES OF TECHNICAL DATA. The following are sources of technical data that may be available, depending on where the projects are in their life cycle.

60.4.1.1 Sources of Requirements. The following are the prime sources of requirements and are listed in order of precedence:

1) Capital Investment Plan (CIP) - Contains general descriptions of the NAS projects;

2) NAS-SR-1000 NAS System Requirements Specification contains top level system requirements for the NAS;

3) NAS-DD-1000 NAS Level I Design Document contains a high level definition which identifies the allocation of functions to specific subsystems;

4) NAS-SS-1000 NAS System Specification - Contains allocated functional/performance requirements and message tables for the information that will cross the interface. This system specification is the document with which the IRD must conform. If discrepancies (such as message differences) are found, they must be resolved, and if required, NCP(s) generated to make all baselined documents conform;

5) Engineering Data Base (EDB) - EDB provides functional interface data including message size and frequency.

The following sources should be used as they become available:

1) Project specifications - These specifications provide additional information for each subsystem.

2) Project Management Plan - This plan contains useful project objectives and schedule and managerial information.

3) Standards and Orders - Various standards and orders specify federal procedures, practices, and protocols for interfacing subsystems. The project manager will be able to aid the interface engineer/author in determining which standards are applicable for a particular subsystem.

4) Related IRDs - Related IRDs, which reference the same subsystem or facility, may prove to be useful in providing requirements. The Interface Management Plan, Appendices I, II, and III, contains a listing of available IRDs/ICDs.

60.4.1.2 Other Sources. In addition to the technical sources mentioned above, there are other sources of information that should be used. These include, but are not limited to, the following people and organizations:

1) Project Manager - The project manager is an excellent source for obtaining up-to-date project information, supplemental documentation, and specific interfacing criteria. The project manager can provide schedules and specific information on the subsystem development phase, and the subsystem specifications.

2) System Engineering - System Engineering provides NAS system requirements information and interpretation of the requirements. System Engineering also provides information relating to requirements verification at the NAS system level [i.e., the Verification Requirements Traceability Matrix (VRTM)].

3) Documentation Control Center - The Documentation Control Center provides copies of interface documentation, FAA standards and orders, etc.

60.4.2 IRD/IR FORMAT AND CONTENT. The following are the controlling documents to be used in the development of the IRD or IR:

1) The applicable Appendix of this standard is to be used for format and content. As a rule, the latest revision of this standard will be used to develop new IRDs. The only exception is for projects that may already be under contract. In this instance, the revision level identified in the contract(s) will be applicable. If there is a conflict between the projects as to the applicable revision level of this standard, Interface Management will work with the project offices to resolve the conflict.

2) The Interface Management Plan (DOT/FAA/ES-85/01, ATC-85-1070) is to be used for guidance in exercising the IRD/IR process.

60.4.3 PLANNING, COORDINATION, AND REVIEW OF AN IRD/IR. Proper planning and early coordination with appropriate personnel, i.e. project managers, System Engineering (ASE for Electronics/AFE for Facilities), and Air Traffic, will expedite the IRD/IR process.

60.4.3.1 Planning. The author should coordinate early to ensure that word processing, graphics, and editing support are available.

60.4.3.2 IRD/IR Coordination. The checklist in Figure 60-2 of this document is for use by personnel developing IRDs or IRs to ensure that the proper coordination is accomplished and that the formal must evaluator process takes a minimal amount of time.

Early coordination does not necessarily mean that all differences of opinion have been resolved prior to the must evaluator review but only that everyone is familiar with the IRD/IR and that no unexpected problems arise. These early discussions will also identify any basic problems, such as disagreements about the messages that will be exchanged.

Coordination is necessary with the following organizations (variations in the approach depend on whether the process is initiated by FAA or SEI personnel):

1) Program Offices - Early discussions with both of the applicable program offices will ensure that SEI project support personnel, FAA counterparts, and project managers are part of the IRD/IR development process.

   These early discussions should emphasize the need to assess the cost impact of the IRD/IR. When IRDs/IRs are formally processed and presented to the appropriate CCB they must identify additional costs that exceed previously approved baseline funding.

2) ATR-100/300 - Early coordination will ensure that Air Traffic concerns are addressed early in IRD development. This will prevent nonconcurrence due to message table problems and identify any need for an NCP. This will also prevent the IRD from being placed on hold until the NCP is finished.

3) ASE - Coordination with the appropriate divisions of the System Engineering organization is required. For example, ASE-200 must be notified of impacts to the basic communications architecture and other divisions within ASE must be informed if changes are required to system documentation (e.g., NAS-SS-1000).

4) ASM-100 - For new IRDs, ASM-100 will review the environmental, electrical and mechanical characteristics, and maintenance-related messages (i.e., remote maintenance monitoring messages). IRs should also be reviewed by ASM if changes are proposed in these areas. ASM is a must reviewer on facility IRDs/IRs for proper space allocation and maintenance concerns.

5) AFE - For facility IRD/IRs, appropriate AFE divisions replace ASE as the system engineering organization for coordination.

6) The following organizations may be involved and require coordination when the IRD or IR development has progressed far enough to analyze impacts:

   a) ASM-320 - This division reviews IRDs/IRs that require the use of leased communications or Radio Communications Link (RCL) services. ASM-320 reviews the IRDs/IRs to ensure that message transfer can be supported as specified in the documents and that the IRD/IR protects the transparency of the transmission interface.

   b) ANC-100(140) - If the IRD/IR requires the use of one of the NAS communication systems that this organization is responsible for, (e.g., data mux, radio communications link, NADIN, low-density RCL), early coordination is required.

While the above steps involve much initial coordination and, in most cases, short "face-to-face" meetings during development, the overall coordination time will be less and many problems will be overcome. Do not send early drafts to anyone for a review unless verbally agreed to. Short face-to-face

meetings should ensure personnel that they are being contacted early for their IRD/IR inputs, but not to prematurely review the documents.

Before the IRD/IR being submitted for formal review, final coordination, and approval, the engineer/author should answer the following questions:

1) Are the requirements in the IRD/IR treceable to the NAS-SS-1000?

2) Is the IRD/IR written in accordance with the latest version of FAA-STD-025?

3) If changes are required to NAS-DD/SS-1000, has an NCP been prepared?

   Note: For a new IRD, that also requires changes to NAS-DD/SS-1000, two NCPs should be generated. An NCP for the IRD is to ensure that when processed and approved, it can be identified to DOCCON as a separate baseline document. Both NCPs should have a statement that case file XXX is in concurrent processing. The NCPs should be submitted at the same time to CM, with an indication that both need to be processed together.

4) Have the VRTMs been developed specifically for this document? Do not copy VRTMs. Verify with the appropriate requirements testing organizations.

5) Are any cost impacts being defined?

   Note: Coordination with the project's financial analysis group will identify the cost of implementing these requirements so that the program manager can determine if the costs are within scope. This will assist in the preparation of the case file needed to baseline the IRD/IR.

60.4.3.3 IRD/IR Review.

60.4.3.3.1 Facility IRDs/IRs. AFE, Facility Systems Engineering Service, is the FAA sponsor for all facility IRDs/IRs. Must evaluators for an individual IRD/IR will consist of the following FAA organizations, based upon the content of the IRD/IR.

FAA Organization	IRD/IR Content
AND-XXX (Appropriate Project)	Dependent on IRD content
AFE-XXX (Appropriate Division)	Dependent on IRD content
ASE-XXX (Appropriate Division)	Dependent on IRD content
ANS-100	All IRD/IRs
ANS-200	All IRD/IRs
ASM-100	All IRD/IRs
ATR-100	All IRD/IRs
ATR-300	AAS and future systems
projects	
Any other FAA organization whose area of responsibility may be affected.	

60.4.3.3.2 Subsystem IRDs/IRs. ASE-600, Engineering Specialities Division, is responsible for the IRD process and for submitting subsystem IRDs/IRs for FAA must evaluation. Must evaluators for individual subsystem IRDs/IRs will consist of the following FAA organizations based on the content of the IRD/IR.

FAA Organization	IRD/IR Content
AND-XXX (Appropriate Project)	Dependent on content
ANS-XXX (Appropriate Project)	Dependent on content
ARD-XXX (Appropriate Division)	Dependent on content
ASE-XXX (Appropriate Division)	Dependent on content
ASE-200	All IRD/IRs with communications and communications protocols.
ASM-100	All IRD/IRs
ASM-300	All IRDs that establish interfacility communications loading and IRs that impact data loading.
ATR-100	All IRD/IRs
ATR-300	AAS and future systems projects
ANC-100	All IRDs/IRs interfacing with NADIN, RCL, and data multiplexing.
ANA-100	All IRDs/IRs that contain RMM information on impact RMM system.

Any other FAA organization whose area of responsibility may be affected.

Use this checklist to establish the points of contact, and to document that contact has occurred. An indication of contact does not mean that total agreement has been reached.

Organization		Personnel	Dates Contacted
Project Office No. 1	FAA	_____	_____
	SEI	_____	_____
Project Office No. 2	FAA	_____	_____
	SEI	_____	_____
ATR-100		_____	_____
ATR-300		_____	_____
ASE-___		_____	_____
ASE-___		_____	_____
ASE-200		_____	_____
ASM-100		_____	_____
ASM-300		_____	_____
ANC-____	FAA	_____	_____
	SEI	_____	_____
ANS-100		_____	_____
ANS-200		_____	_____
ANA-100		_____	_____
AOS-____		_____	_____

On the following page is the Interface Requirements Document checklist. This checklist is to be used to aid in the development of interface requirements documentation.

Figure 60-2 IRD/IR Development and Review Checklist

Quality Assurance Checkpoint	Confirmed by	Date
1. Ensure that the IRD is developed in accordance with the lattest version of FAA-STD-025, unless there are contractual obligations to use another version of FAA-STD-025.		
2. Ensure that "DRAFT" IRD versions are noted as such in the document header.		
3. Ensure that the Table of Contents is generated during IRD development by marking paragraph titles, versus manually composed.		
4. Ensure that document titles cited in Section 2, Applicable Documents, are correctly defined with the current revision level and date.		
5. Ensure that all documents referenced in the IRD test have been cited in Section 2.		
6. Ensure that document revision letters are referenced only in Section 2.		
7. Ensure that paragraphs are structured so only one requirement or "shall statement" is defined per each unique identifiable text entity.		
8. Ensure that references to "who does what" are clear and accurate (eg. The TCCC shall provide).		
9. Ensure that each requirement is Section 3 is addressed with a one-to-one correspondence in the VRTM.		
10. Ensure that verification phase/method entries in the VRTM have been coordinated with IFM and the project.		
11. Ensure Tables and Figures are legible and properly aligned on the page.		
12. Ensure that Tables and Figures are placed on the page directly following their text reference. In the case of multiple references per page, position them in the order which referenced.		
13. Ensure grammar is correct and content is clear.		
14. Ensure that entire document has been Spell-checked.		
*15. Ensure that square footages for panel mounted components are calculated using Width x Height.		
*16. Ensure that square footages include required clearance space for the component.		
*17. Ensure that the heat generated value is calculated from the kVA value, unless citing known values.		
*18. Ensure that the "Development Guide for IRDs and IRs" has been followed.		
19. Ensure that the IRD development has been coordinated with both project office and System Eng (ASE), or for Facility IRDS, the project office and Facility Eng (AFE).		

*For Facility IRDS.

60-2 (concluded) Interface Requirements Document Checklist

APPENDIX VII

70. LESSONS LEARNED

70.1 Introduction. This appendix is dedicated to presenting some of the problems encountered during the development of interface documentation and to offer suggestions that would prevent any recurrence of problems that were experienced previously. These problems were documented by a joint AND/ASE Quality Action Team which reviewed the document development process in order to avoid any unneccessary delays.

70.2 Lessons learned. The following are lessons that were learned from actual problems that were experienced during document development. Some of these contain suggestions to avoid similar difficulties in the future.

70.2.1 Interface issues. Attempting to resolve interface issues without coordination with Systems Engineering will result in the delay in the issuance of approved IRD's.

70.2.2 Interface requirements. Technical interface requirements of the NAS are generally not negotiable. They flow from the NAS-SS-1000 which ensures compatibility and performance of NAS interfaces.

70.2.3 Contractor involvement. Contractors do not realize the amount of effort required to draft, review, and finalize Interface Control Documents. Some contractors believe that providing preliminary and final ICD drafts are the sum of their responsibility.

It is recommended that the (SOW) should contain specific paragraphs that specify the government's requirements for contractor involvement in the generation of ICDs. These paragraphs should list obligations such as coordinating with interfacing contractors, participation in Interface Control Working Groups (ICWGs) & Technical Interchange Meetings (TIMs), resolving technical interface issues, and the production of a baselined version of the ICD. It should be made clear that these responsibilities continue until the ICD is formally baselined. Interface Management (ASE-630) has draft SOW, CDRLs, and DIDs as well as a draft letter to assist program managers coordinate with interfacing program managers.

70.2.4 ICD baselining. Having contractors review documents and provide comments will aid development of an ICD in a limited manner. If agreement is slow in coming between the two contractors building the interface, a meeting must occur to resolve issues. The project office must recognize when progress is not being made and act to facilitate agreement between the parties involved.

An additional lesson learned has been the great value in holding a meeting with all concerned parties present to resolve issues. Often a meeting is required to achieve closure of the ICD process. In order to be successful, the meeting should contain the following elements:

a. Project personnel from both projects that have the authority to make decisions, and sufficient technical expertise to advise both project leads.

b. Contractor personnel that have the authority to commit to decisions, and personnel with technical expertise to advise them.

c. Contractor personnel on standby at their plants that can be contacted to confirm a technical issue that goes beyond the expertise of the personnel at the meeting.

d. At the meeting the parties must agree who will do any changes that are agreed upon, set dates on which follow-on events will occur; i.e. final draft completion, response deadlines, etc. During the meeting every page of the ICD must be reviewed and an agreement reached that all parties are in agreement that no further changes are necessary to each page.

70.2.5 ICD Milestones. The ICD development process is very informal and vaguely understood. A suggestion is to provide identifiable milestones that track ICD development. These milestones should be mutually agreeable to both projects. Putting the ICD under the control of the lead project after CDR assures that any contractor-initiated changes from that point on have project approval.

70.2.6 ICD compliance. Project personnel must baseline an approved ICD before their contractor begins building the interface. It can be quite costly to make changes after construction of the interface has begun.

70.2.7 NDI/COTS procurements. NDI/COTS procurements present a problem for ICD development. Because these procurements are non-developmental, there are no formal PDRs and CDRs. Since the system design is usually predetermined for these procurements, interfacing contractors require documents that contain design information in order to develop an interface to that item.

The Statement of Work (SOW) must contain a requirement to deliver an ICD at contract award or at another negotiated time. It should be recognized that for Non-Development Item (NDI)/ Commercial off-the-Shelf (COTS) procurements the ICD will not meet the format requirements of FAA-STD-025, but must contain adequate design information that meets the design characteristics requirements (section 3) of an ICD. The ICD that is delivered on a NDI/COTS procurement will be the design document for that interface. To assure that there are no conflicts, interfacing projects have to coordinate during the acquisition strategy period, market surveys, etc. to assure that the interface will be satisfactory.

70.2.8 Contracted IRD version. Due to the contract process, it is possible that interfacing contractors may be on contract for different versions of Interface Revisions (IRs) that have been approved. This can be an obstacle to the coordination of ICDs between contractors due to the contrasting set of interface requirements. This situation needs to be recognized and coordinated between program managers.